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INTERCEPTOR SEWERS AND SUBURBAN SPRAWL

THE IMPACT OF CONSTRUCTION GRANTS ON RESIDENTIAL LAND USE. VOLUME II: CASE STUDIES

URBAN SYSTEMS RESEARCH AND ENGINEERING, INCORPORATED

PREPARED FOR
COUNCIL ON ENVIRONMENTAL QUALITY

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The purpose of the study was to explore the extent to which funds granted by EPA for financing construction of interceptor sewers may impact residential housing patterns in the communities served by these interceptor projects, the extent to which the impacts are being evaluated in the planning review and EPA approval of the project grants, and the ways in which EPA policies and procedures might be modified to lessen the adverse secondary impacts of interceptor construction on current development patterns.

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DRAFT FINAL REPORT

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Introduction to the Case Studies

This is the second volume of a two-volume report which presents the results of a study designed to explore the impact of United States Environmental Protection Agency interceptor sewer grants on residential land use patterns. In Volume I of this report, the objectives and scope of the study are described, and the major findings, recommendations, and study analyses are presented. This second volume presents independent case studies of the interceptor planning process as it evolved in eight local areas which were recently awarded EPA grants for interceptor construction. These case studies seek to describe the way in which land use and related community planning considerations entered into the interceptor design, review, and approval process. These are descriptive rather than analytical reports; the reader should refer to Volume I for a discussion of the policy implications of the planning and review processes described in these case studies.

The case studies which comprise this volume of the report follow a common format. In Section 1 of each study, the interceptor project and the community it will serve are described, and a brief history of the project is provided. Section 2 discusses the general land use planning situation in the community-the population and land use trends of the area, the land use agencies and their impact on development, and the land use controls which exist to control development. The remaining sections of the studies focus on the evaluation of potential land use impacts of the project. Section 3 describes the type and extent of land use impact analysis undertaken; Section 4 discusses what, if any, influence this land use impact evaluation had on either the planning or approval of the project; and Section 5 considers the degree to which other project plans--such as staging, financing, or regionalization--may affect the land use implications of the projects. The Appendix to each case study contains tables, charts, and maps illustrating interceptor location and specifications, population trend and land use patterns.

Staten Island, New York

1. Introduction

1.1 Project Description

Staten Island (or Richmond County) is one of the five boroughs of New York City. It retains a largely suburban and rural character, in striking contrast to the dense development patterns of the rest of the nation's largest city. The physical isolation of Staten Island which retarded its development was abruptly ended in 1964 when the Verrazano-Narrows Bridge was opened, providing easy access to the rest of New York City. Residential construction, already increasing in anticipation of the bridge opening, quickened its pace in the second half of the 1960's, especially in the undeveloped southern half of the island. This region includes the most rapidly growing parts of Staten Island--half of the land area is still undeveloped.

The Oakwood Beach Water Pollution Control Project is an ambitious program to serve the wastewater collection and treatment needs of South Richmond, which is largely unsewered. The initial phase of the Oakwood Beach Project includes an expansion of the existing Oakwood Beach Sewage Treatment Plant from a capacity of fifteen million gallons per day to forty million gallons per day and the construction of two sections of an interceptor network (the West Branch noted as 6C and the Eltingville as EL-18 in Figure 1) which will serve the South Richmond area and flow into the Oakwood Beach STP. These two interceptors will measure approximately 9,500 feet

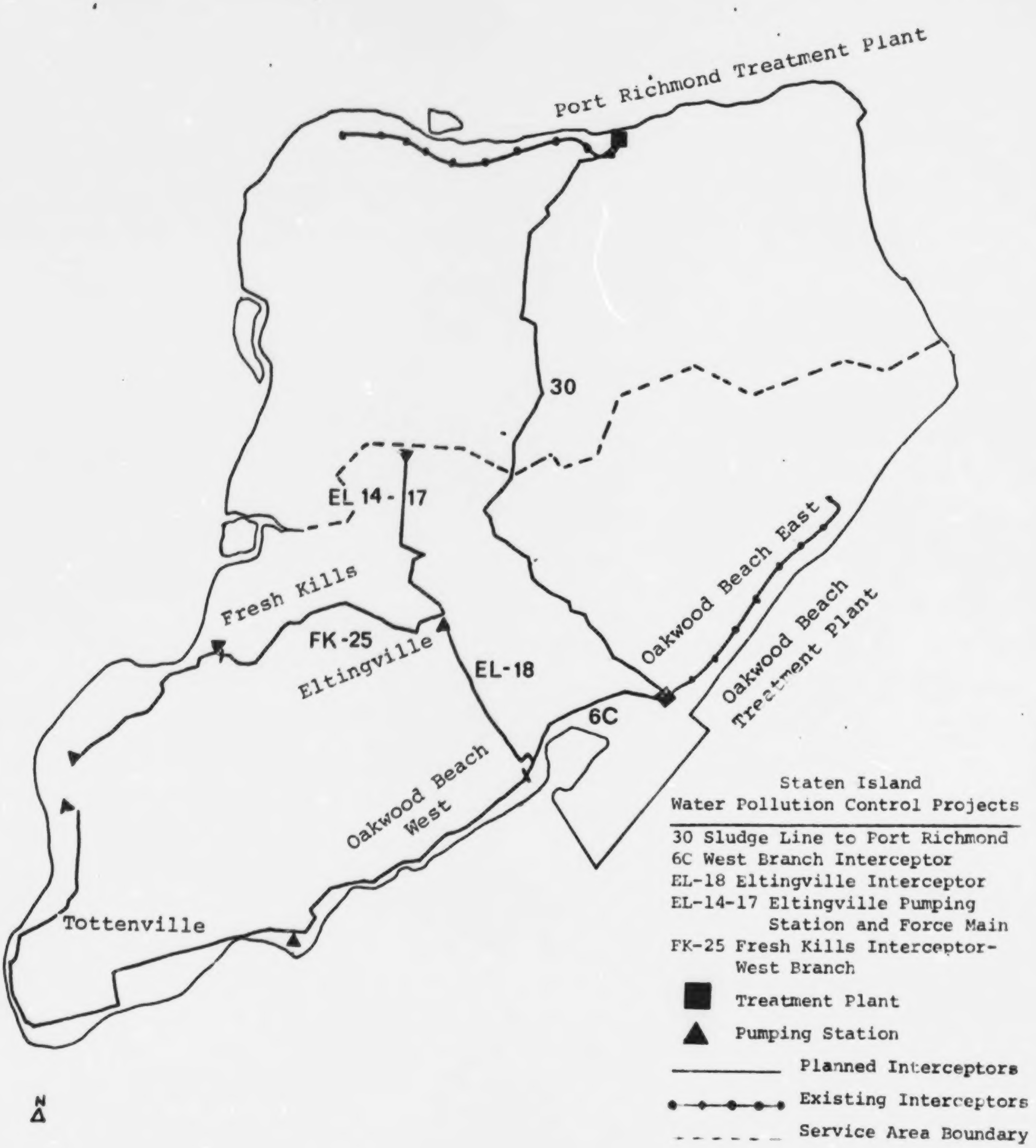
Port Richmond Treatment Plant
30
EL 14 - 17
Fresh Kills
FK-25
Eltingville
EL-18
Oakwood Beach East
Oakwood Beach Treatment Plant
6C
Oakwood Beach West
Tottenville
N
Staten Island
Water Pollution Control Projects
30 Sludge Line to Port Richmond
6C West Branch Interceptor
EL-18 Eltingville Interceptor
EL-14-17 Eltingville Pumping Station and Force Main
FK-25 Fresh Kills Interceptor-West Branch
Treatment Plant
Pumping Station
Planned Interceptors
Existing Interceptors
Service Area Boundary

FIGURE 1: STATEN ISLAND
POLLUTION CONTROL PROJECTS

and 11,000 feet, respectively, and will cost a total of $42 million. In its final form, the Oakwood Beach Project will involve construction of 26 miles of interceptor sewers and expansion of the treatment plant to 80 MGD.

1.2 Project History

Sewerage plans for all of Staten Island were first developed in 1906, but it was not until the mid-1960's, in response to the growing needs for additional sewage treatment facilities, that the New York City Department of Public Works commissioned studies on the two sewage treatment plants and related interceptor sewer networks to serve Southern Staten Island.[1] These two studies provided the basic hydrological and population land use information on which the Oakwood Beach project is based. However, by 1969, as a result of local public opposition to new treatment plant construction and, most importantly, because of federal aid guidelines encouraging regionalization, New York City revised its plans to eliminate the two proposed treatment plants at Tottenville and Fresh Kill and replace them with a major expansion of the existing treatment plant at Oakwood Beach.[2]

The revised Oakwood Beach project was given a high priority by both the city and state of New York, but gaining federal approval and funding proved to be a slow process. To speed up approval, the project was divided into stages, leaving most of the sewer interceptor construction for later funding. The first stage was given final approval on March 1, 1973. As of June 1974, however, work on interceptor construction had not begun because of controversies over equal employment opportunity provisions of the construction contracts. Work on the Oakwood Beach Treatment Plant improvements was underway.

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[1] City of New York Department of Public Works, Tottenville Pollution Control Project--Project Report, January 1967, and New York City Department of Public Works, Comprehensive Sewerage Study and Report--Fresh Kills Pollution Control Project, June 1968.

[2] City of New York Environmental Protection Administration Department of Water Resources, Oakwood Beach Water Pollution Control Project--Report, April 1969.

Southern Staten Island has experienced severe pollution problems as a result of improper or inadequate sewage treatment for new residential development. Residential construction has relied heavily on the use of septic tanks despite the inadequate drainage provided by the clay soil. Other residential developments have connected to small local sewer systems which, before 1969, frequently led to discharges of raw sewage. Later developments were built with package treatment plants, which have, in some cases, already proven inadequate. As late as 1972 homes were being built with septic tanks. This pattern has led to a series of incidents of septic tank seepage in areas of inadequate drainage, leading to surface and subsurface water pollution and, in some cases, public health hazards. As a result, the need for a sewer interceptor system to serve developed, unsewered areas of Staten Island is recognized by public officials and private citizens.

The expansion of the Oakwood Beach Sewage Treatment plant is also clearly needed, because the plant is currently operating near its capacity of fifteen million gallons per day. The expansion currently under construction to forty MGD is expected to provide adequate service only to 1986 as more and more existing homes are linked to the treatment plant by the interceptor network.

The encouragement of residential housing development in the Oakwood Beach project area is an explicitly stated goal of the project. The city government of New York views this area of Staten Island as its last remaining land resource for moderate density housing development. It would like to encourage development as an addition to the tax base. A press release from the New York City Environmental Protection Administration announcing the opening of bids for the expansion of the Oakwood Beach Treatment Plant declared,

> The approval by the federal government to let the city go ahead with the upgrading of the plant and their commitment for funding will permit the development of the southern part of Staten Island. It will spur the development of that part of Staten Island not readily feasible for home building but providing an outlet for sanitary flow which is now provided for only by inadequate septic tanks.[1]

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[1] The City of New York Environmental Protection Administration, Office of the Administrator, press release, August 3, 1973.

2. Land Use Planning

2.1 Population and Land Use Projections

The population projections used in the planning of the Oakwood Beach project were derived from a variety of sources. The Tottenville Pollution Control Project Report referenced studies by the Regional Planning Association, Harvard University, New York City Board of Water Supply, Consolidated Edison, the City Planning Commission, the U.S. Post Office, and the Tri-State Transportation Commission as sources for population projections. The reason for consulting all of these alternative sources is the tremendous uncertainty about the rate of population growth on Staten Island. The impact of the Verrazanno-Narrows Bridge makes extrapolation of past growth trends very uncertain.

The concensus population projections used in the planning report for the Oakwood Beach treatment plant are shown in Table 1. These projections of rapid population growth for Staten Island and even more rapid percentage increase for the Oakwood Beach area may be somewhat over-optimistic, at least in the short run. Because of adverse economic conditions in the housing industry, residential construction in this area during recent years has not kept pace with the trend of the 1960's.

In addition to the uncertainties about the rate of population growth, there are also questions about the projected ultimate population which is based on the density possible under current zoning. Current zoning rules which encourage residential development for population densities of 70 people per

Table 1

Population Projections

Year	Staten Island	Oakwood Beach	% of Total in Oakwood Beach
1970	300,000	132,000	44
1980	455,000	227,000	50
1990	630,000	335,000	53
2000	800,000	434,000	54
2010	920,000	506,000	55
2020	1,000,000	550,000	55

Source: City of New York Environmental Protection Administration, Department of Water Resources, Oakwood Beach Water Pollution Control Project--Project Report, April 1969.

acre and above would allow a maximum population of about 1,600,000 for all of Staten Island.[1]

Whether this level of density will be reached in Staten Island is a subject of some controversy. In the Oakwood Beach project report, the population projections were scaled down considerably to reflect the fact that development rarely completely fills the zoning envelope. Even the scaled down projections have been criticised as being excessive. The New York State Office of Planning Coordination commented,

> The population projections determined by the consultants, based upon the zoning envelope, although reduced by 25-35%, is too generous. To design the Oakwood Beach plant for a capacity of 80 MGD for a 2020 population of 550,000 is unrealistic. It does not conform with more refined and concise projections by the Tri-State Transportation Commission, OPC, and New York City Planning Department. The New York City Planning Department declares that the zoning capacity for the entire borough of Richmond is 862,000.[2]

On the other hand, there is the possibility that the population projections for the Oakwood Beach region are too low. In 1970, the Rouse Company proposed a new city development in part of the Oakwood Beach service area. This ambitious program proposed three alternative models for population density: a low density new city of 300,000 people, a medium density city of 450,000, and a high density city of 675,000. The Rouse Company report acknowledged that the middle density and high density plans would require expansion of the sewer system; the middle density new city could require conversion of the Tottenville Pumping Station to a treatment plant and the high density model would require major expansion of the interceptor network.[1] Political controversy over the proposed new city has made it unlikely that any of these ambitious alternatives will be adopted. The New York City Planning Department has recently developed a more modest land use plan for South Richmond which projects an upper limit on population of 275,000-300,000 and requires no major changes in sewer plans.[2]

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[1] Oakwood Beach Project Report, p. 10.

[2] State of New York, Office of Planning Coordination, "Memorandum: New York City-Oakwood Beach Water Pollution Control Project," July 31, 1969, p. 3.

It is interesting to note that the uncertainties and controversies over population and land use projections have had no major impact on the plan for sewer interceptor construction. Minor modifications have been made to adjust to local patterns of development, but overall plans do not reflect either the slowing of the growth rate of Staten Island or any proposals for ambitious new development.

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[1] The Rouse Company, An Analysis of Development, Trends and Recommendations for a New City in South Richmond, 1970, p. 75.

[2] New York City Department of City Planning, Staten Island Office, South Richmond Land Use Proposal, November 1973, p. 3.

2.2 Current Trends in Population and Land Use

Rates of development in population growth in Staten Island slowed considerably after the first years of the boom that followed the opening of the Verrazano-Narrows Bridge. It is not clear whether this reflects the end of that boom, or simply a temporary contraction of the housing industry. Staten Island has experienced a boom period before, in the 1920's, when in anticipation of a mass transit link to Brooklyn, a great deal of real estate speculation occurred. The cancellation of the subway plan, followed by the Great Depression, ended that real estate boom. It was not until 1969 that the rate of private residential construction surpassed 1923's record of 2,675 dwelling units per year.[1]

Although residential development and consequently population growth are slower than in the 1960s, the rate is still substantial. In 1972, over 2800 dwelling units were completed, over half of which were in the Oakwood Beach area.[2] The density of residential construction has been rising over the years in Staten Island as two-family houses have overtaken the single family home as the most popular type being built. Most of the construction occurs in scattered subdivisions using small building lots on streets following the grid patterns laid out during the boom of the 1920's. Except for the higher density, the residential patterns in Staten Island resemble the sprawl found in suburban areas throughout the country.

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[1] New York City Planning Commission, New Dwelling Units Completed 1921-1972 in New York City, December 1973, pp. 20-22.

[2] New York City Planning Commission, New Dwelling Units Completed 1972, August 1973, p. 13.

2.3 Land Use Controls

Land use planning in Staten Island, according to city officials, has generally been very weak. The master plan, although slickly presented, provides a description of current development trends rather than a comprehensive program for development.[1] Part of the problem may be the lack of familiarity of urban-oriented planners with the problems of a semi-rural area like Staten Island. The City of New York has considerable leverage in controlling the patterns of development in Staten Island because it is the major property owner in Staten Island. In the South Richmond area the city owns nearly half the vacant land, much of which was acquired through tax defaults. Until the mid-1960s New York City's policy was to sell this land as rapidly as possible in order to return it to the tax rolls, and to encourage new housing construction in the last major undeveloped residential area in all of New York City. In the mid-1960s there was a belated recognition of the value of the resource represented by Staten Island's open space. The sale of city-owned land ceased and plans were instituted to urge a more orderly pattern of development. Recent proposals for new zoning controls would preserve outstanding natural features of the remaining open space on Staten Island, encourage planned unit development of residential areas and use a point system to restrict residential development to areas with adequate physical, educational and social services. Within the constraints of these safeguards, however, it is still the policy of New York City to encourage residential development in Staten Island, and it is providing schools, roads and transportation services to accommodate considerable population growth.

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[1] New York City Planning Commission, Plan for New York City 1969, A Proposal, Vol. 6, Staten Island.

3. Land Use Impact Evaluation

The Oakwood Beach Water Pollution Control Project has gone through many reviews and revisions during its torturous route toward approval, funding and construction. Although the technical engineering aspects have been subject to rigorous review, and the impact on water quality reexamined several times, the issue of impact on land use has received very little attention. The project has found overwhelming support from all levels of government and achieved a broad base of public support. The growth that the project will encourage has been questioned very rarely. An in-depth analysis of the environmental costs of residential growth has never been made.

3.1 Governmental Review

A variety of agencies on several levels of government have participated in project reviews where the issues of environmental impact might have arisen. These agencies have differed in their concern over land use impacts and in their conclusions about the probable level of impact of the interceptor construction.

At the local level, the New York City Planning Department has responsibility for land use planning and projection. Officials in its Staten Island Office acknowledge that there is little coordination between the planning department and those responsible for developing the interceptor system. In their land use planning City Planning officials have taken the interceptor project as a given. Although they are concerned about the impact of the treatment system on their land use projections, they do not expect explosive growth as a result. A newly proposed point system to control residential development will restrict new construction where storm drainage, schools, streets, and parks are inadequate. The requirement for storm drainage is expected to be especially effective in slowing down the rate of development.

The New York City Environmental Protection Agency, which is the sponsoring agency for the Oakwood Beach Project, demonstrates an ambivalent view toward the environmental impacts of residential development in its environmental assessment for the second phase interceptor construction of the Oakwood Beach project.[1] In evaluating the environmental impacts of not constructing the interceptor, it notes

> No action will imply no further development in virgin areas and a possible environmental plus. However, past history indicates that no action will result in development in an environmentally unsound way. The only advantage would be a savings of resources for the short term, but would probably mean greater expenditures in the future.[1]

It thus makes the plausible argument that pressures for development will not cease for lack of an interceptor, but about the impact of the treatment system on their land use projections, they do not expect explosive growth as a result. A newly proposed point system to control residential development will restrict new construction where storm drainage, schools, streets, and parks are inadequate. The requirement for storm drainage is expected to be especially effective in slowing down the rate of development.

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[1] Environmental Protection Administration, Department of Water Resources, Bureau of Water Pollution Control, Environmental Assessment for Contracts EL14-17 and FK19, December 12, 1973, pp. 5-7.

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It thus makes the plausible argument that pressures for development will not cease for lack of an interceptor, but will simply result in more water pollution. On the other hand, the same document later argues that failure to construct the interceptors will force the developers to provide their own sewage treatment, which creates a severe economic burden because of the capital investment required. This "leads to a hesitancy on the part of the developer to develop land which offers a unparalled opportunity to create exciting new communities on a large scale."[1] The argument that the lack of interceptors is not a hindrance to small scale residential construction, but would deter massive new town developments is unconvincing. With the exception of these brief comments, the document does not discuss further the issue of the type and magnitude of land use impacts of the projects.

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[1] Environmental Protection Administration, Department of Water Resources, Bureau of Water Pollution Control, Environmental Assessment for Contracts EL14-17 and FK19, December 12, 1973, pp. 5-7.

The A-95 review process also touched on the issue of land use impacts. In 1969 the New York State agency charged with reviewing the initial Oakwood Beach plan recommended a change in the scheduling of interceptor construction to complete the sewers and pumping stations along the south shore to Tottenville before the Fresh Kills Branch was begun. The purpose of this proposed change was to affect the pattern of land use: "Such phasing would sewer areas already developed or about to be developed (Annadale-Huguenot), and hold back the development of the vacant lands until the city is ready to provide all of the other necessary improvements for the new areas-streets, storm sewers, schools, parks, etc."[1] However, the official A-95 review agency, the Tri-State Transportation Commission, approved the Oakwood Beach project enthusiastically without any comment on possible land use implications or alternative phasing.[2]

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[1] Ibid. p. 7.

The Federal Environmental Protection Agency in its environmental assessment of the Oakwood Beach project directly addressed the issue of land use impacts:

> Secondary Effects - Of major importance is the effect this project will have on development of Staten Island. The borough is presently growing at a rate of 12,000 annually. The construction of a sewerage system such as proposed will tend to accelerate housing development, perhaps to the point of straining the areas capacity to support such growth. [3]

However, the assessment concludes that this impact is not significant:

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[1] State of New York, Office of Planning Coordination, "Memorandum: New York City-Oakwood Beach Water Pollution Control Project," July 31, 1969.

[2] Tri-State Transportation Commission, "New York City: Oakwood Beach Water Pollution Control Project," July 23, 1969.

[3] U.S. Environmental Protection Agency, "Environmental Assessment: Project No. WPC-NY-3952," p. 2.

> The amount of development taking place in Staten Island will not be significantly affected by the construction of the proposed Oakwood Beach sewerage system; however, the rate of development will be stimulated. Development plans (South Richmond Bill) are already presented for the area. [1]

Thus, despite the expressed concerns of EPA regional staff over land use implications, the preparation of an Environmantal Impact Statement has not been required nor have any changes to ameliorate land use impacts been proposed.

3.2 Non-Governmental Involvement in Project Review

Public attitudes toward the Oakwood Beach interceptor project have been, according to all sources, overwhelmingly favorable. A recent public hearing on the proposed second phase of interceptor construction did not arouse a great deal of public interest, but those who did appear and speak demanded the acceleration of the interceptor construction to eliminate the health hazards and aesthetic degradation caused by existing septic tank systems.[2]

Considerable public controversy has arisen over the phasing of the interceptor construction program. Residents of areas scheduled for later phases of funding have strenuously protested and demanded that their sewers be constructed first. Housing developers who need the interceptors before they can start construction have been especially vocal in their demands for changes in phasing. Groups opposing development, if they exist on Staten Island, have not come forth publicly.

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[1] Ibid. p. 4.

[2] City of New York Environmental Protection Agency, "Public Hearing on the Construction of Eltingville Pumping Station," February 19, 1974.

4. Influence of the Impact Evaluation

During the several years that planning for the Oakwood Beach Water Pollution Control Project has been underway, a great many changes and revisions in the project design have been made. As recently as June 1974, changes in flow projections and revisions in the blueprints for the two main interceptors were still being made. Because so many factors may influence design changes, it is difficult to segregate the influence of land use concerns on project modifications. However, in general, those involved in project planning maintain that land use impacts have not been an influential factor. Some design modifications have been made to reflect changes in existing or in projected land use. These alterations do not reflect an effort to control land use but only to accommodate the growth that is occuring.

5. Other Factors Influencing Land Use

5.1 Project Staging

Current plans for the Oakwood Beach Interceptor System call for completion of the sewerage network in four phases to be constructed over the course of several years. This phasing could be used as a powerful tool to control the direction of development in southern Staten Island, but in fact the reasons for phasing are much more related to engineering and economic factors than land use concerns. The principal reason for phasing is the tremendous cost of the total project, which makes funding in any single year difficult to obtain. Spreading the costs over several years allows other desirable projects in New York State to receive some funds. Another important reason for phasing the interceptor construction schedule was the need to coordinate it with the timetable for the expansion of the Oakwood Beach treatment plant, which will require several years for completion. Construction of the entire sewer network before the expansion of the treatment plant might have resulted in overwhelming the existing capacity for sewage treatment. Since the treatment plant expansion is now underway, while the interceptor construction contracts are being held up, it appears likely that the interceptor construction schedule will be compressed once it gets underway.

5.2 Financing

Until 1962, New York City financed the construction of collection sewers by assessments on abutting property owners. Since that time, all sewer construction has been financed out of general city tax revenue with no charges to residents for connection or use of sewers. This policy results, of course, in significant cost savings for new residents who would have in the past paid sewer connection charges. As such, it provides a subsidy for new residential construction.

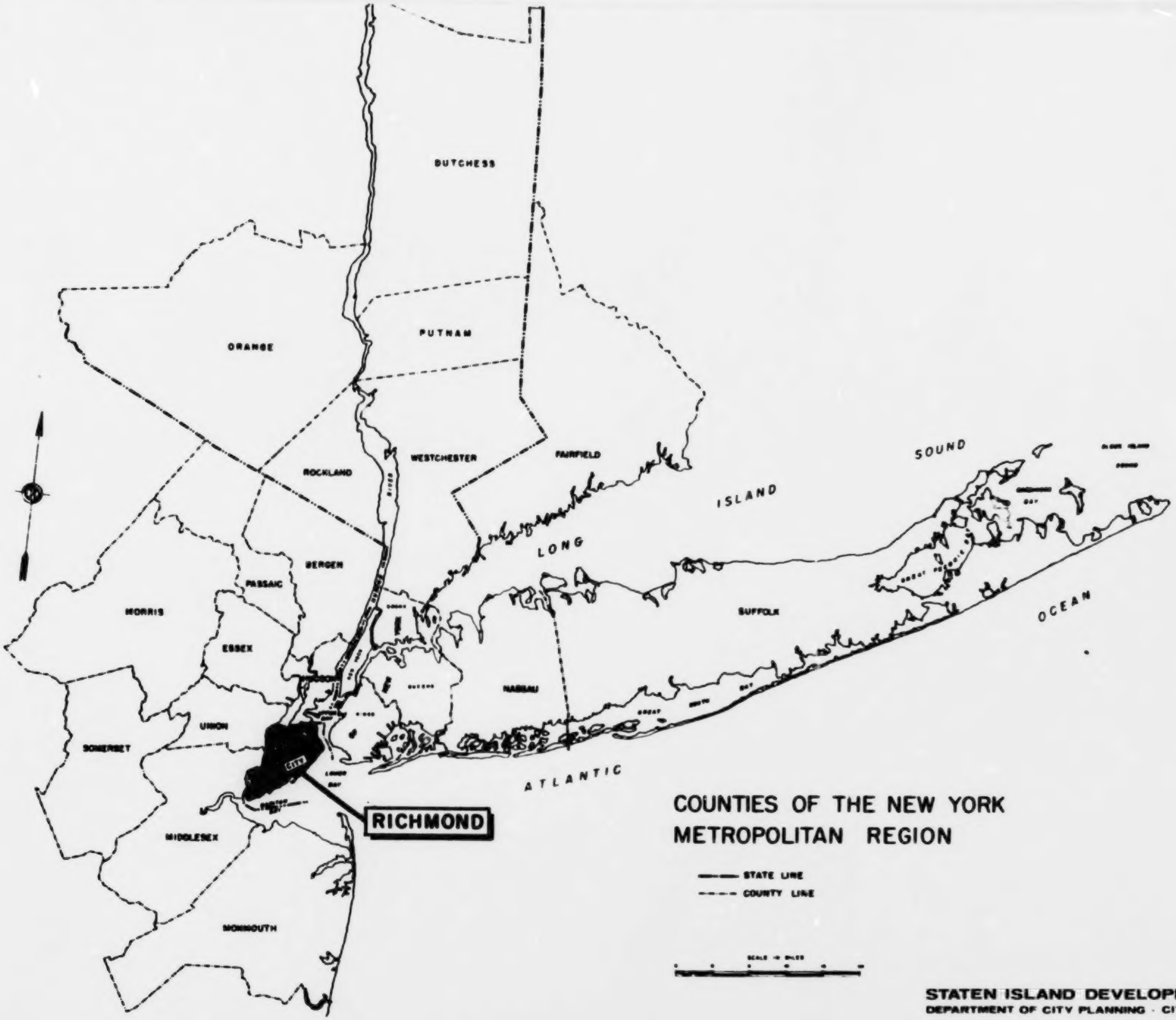
On the other hand, the assumption by New York City of the costs of installing collection sewers is not an unmixed blessing to new developments. There are many claims on New York's tax revenues, which severely constrain the amount of money available for sewer installation. As a result, the installation of sewers may take place more slowly than it would have under the old financing methods.

5.3 Regionalization

The original plans for sewage treatment on Staten Island envisioned four treatment plants. The final plan eliminated two new plants at Totten ville and Freshkill, replacing their capacity with an expansion of the existing Oakwood Beach plant. This step toward regionalization has strong engineering and economic logic behind it. It is interesting to note, from the point of view of land use impacts, that the change in treatment plants did not have a major impact on the size of the interceptor network. While slopes and flow directions of the interceptors were changed, the overall mileage of the network, and even the routes, were not greatly changed. Thus, at least in Staten Island, the implication that greater regionalization leads to larger interceptor networks and hence greater stimulus for residential development is not borne out.

APPENDIX

OAKWOOD BEACH INTERCEPTOR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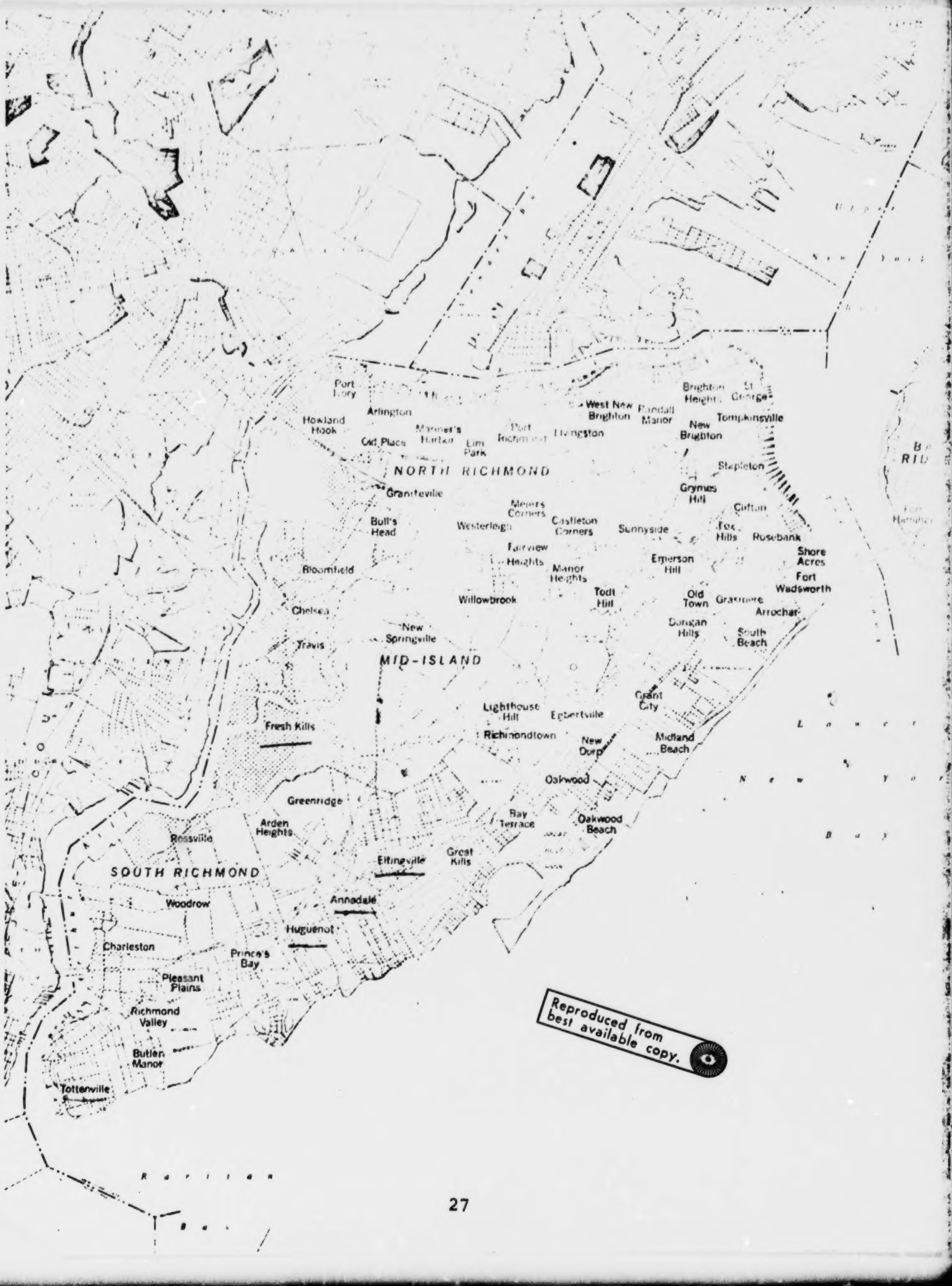
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Clifton
Bull's Head
Westerleigh
Castleton Corners
Sunnyside
Fox Hills
Rosebank
Fairview Heights
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Bloomfield
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Willowbrook
Todt Hill
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Oakwood Beach Interceptor Sewers

	6C	EL-18
Length	9,427'	10,794'
Maximum Dimension	78 in diameter	8' x 7'
Cost	$25,000,000	$16,800,000

Projected Residential Population Equivalents

1970	25,000	——
1978	67,000	39,400
1986	221,500	139,600
2020	480,900	307,000

Projected Flows in MGD

1970	4.00	—
1978	9.07	5.32
1986	28.72	18.98
2020	65.50	42.18

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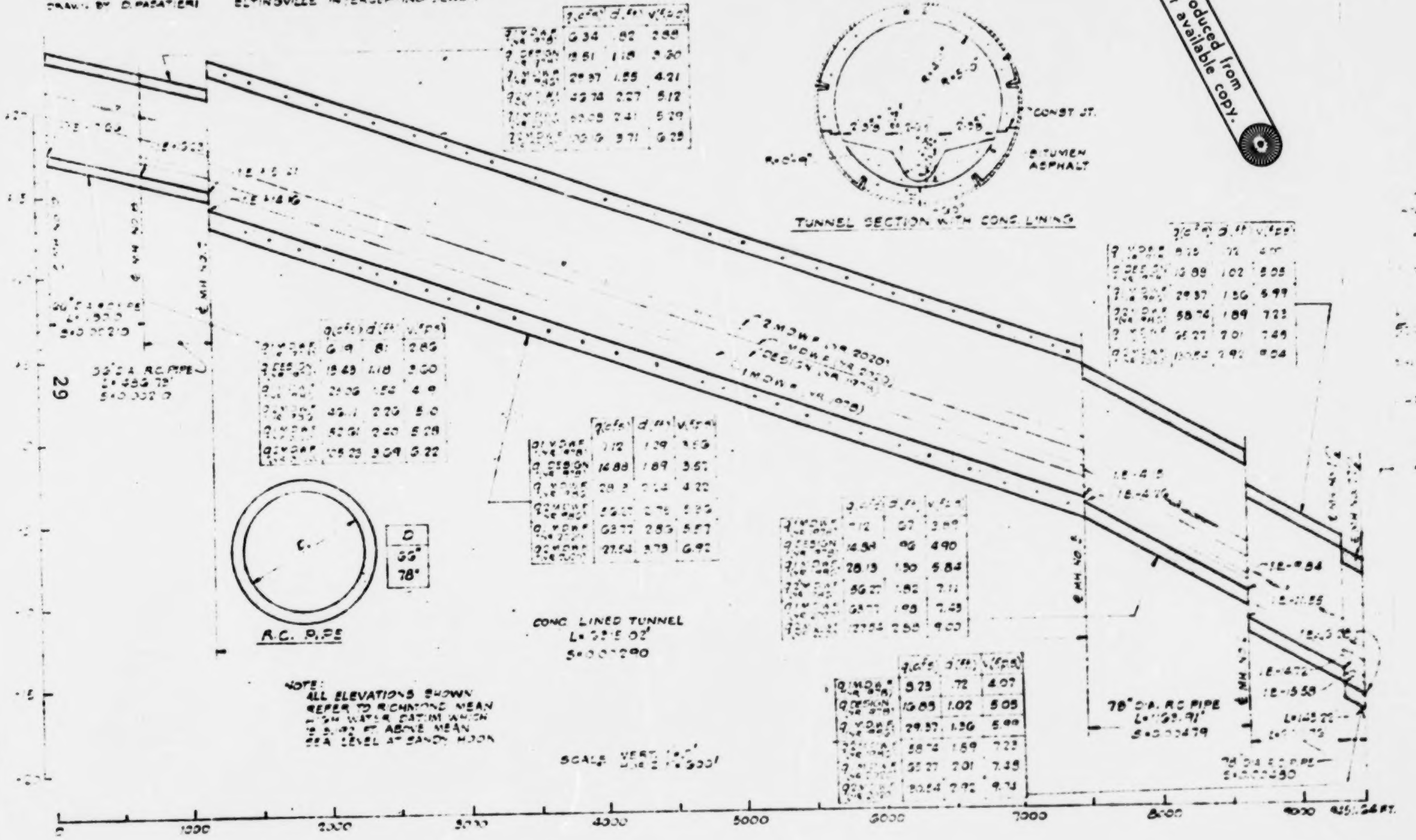
CHKD BY DATE HYDRAULIC PROFILE-CONTRACT EL-18 JOB NO
DRAWN BY D. PASATIERI ELTINGVILLE INTERCEPTING SEWER

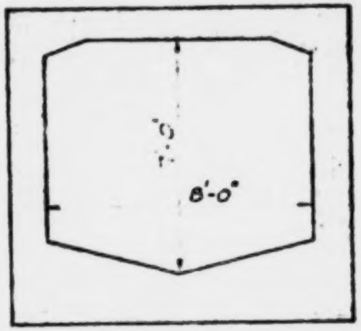

TUNNEL SECTION WITH CONC. LINING
CONST. JT.
BITUMEN ASPHALT
R.C. PIPE
D
66"
78"
CONC. LINED TUNNEL
78" DIA. R.C. PIPE
66" DIA. R.C. PIPE
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

NOTE:
ALL ELEVATIONS SHOWN
REFER TO RICHMOND MEAN
HIGH WATER DATUM WHICH
IS 3.183 FT. ABOVE MEAN
SEA LEVEL AT SANDY HOOK

SCALE VERT. 1"=5'
HOR. 1"=500'

DATE [illegible] SUBJECT P.N. 153 OAKWOOD BEACH W.P.C.P. SHEET NO. OF
DATE HYDRAULIC PROFILE - CONTRACTS GB & GC JOB NO.
BY [illegible] WEST BRANCH INTERCEPTING SEWER

WORKING COPY 7-11-74
(SUBJECT TO FINAL CHECKING & MODIFICATIONS)



R.C. MON. INT. SEWER

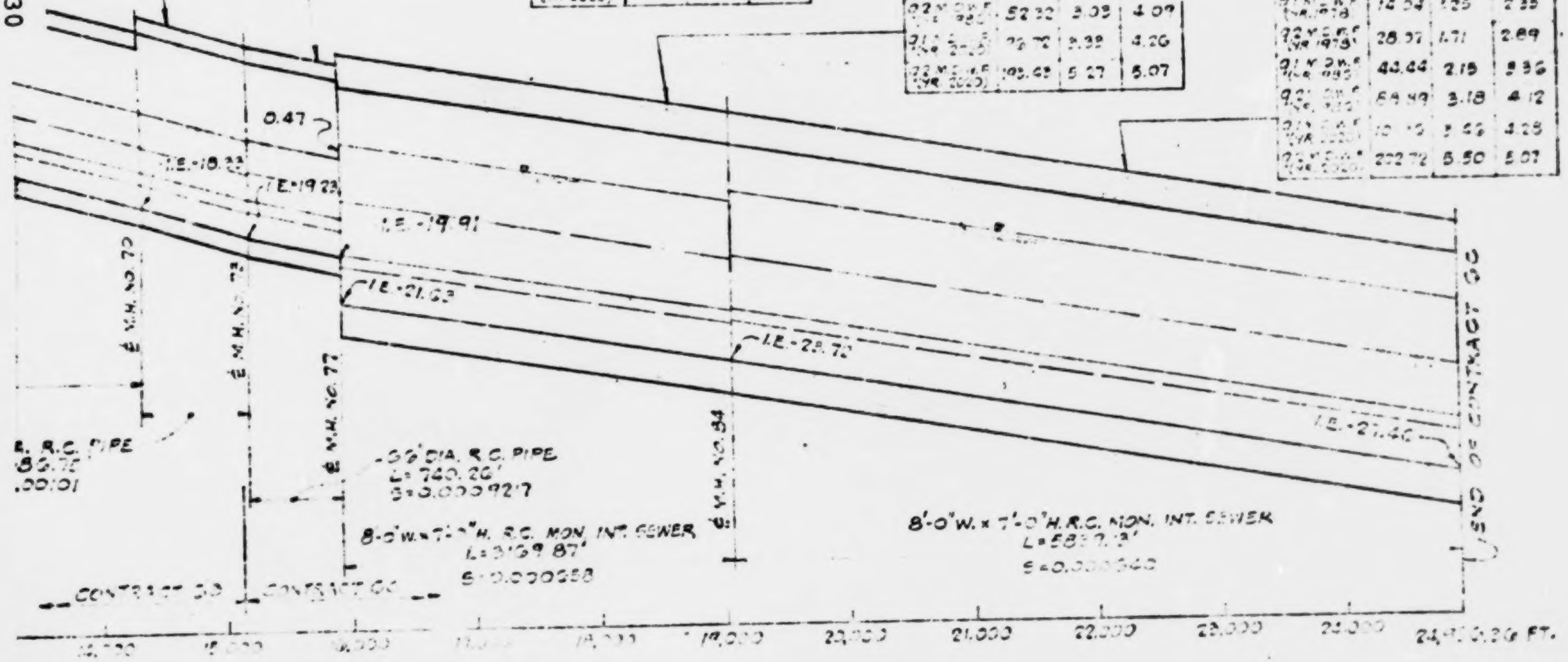
	q(c.f.s.)	d(ft)	v(f.p.s.)
Q1 M.D.W.F. (YR 1978)	3.64	.70	[illegible]
Q DESIGN (YR 1978)	8.42	1.04	2.79
Q1 M.D.W.F. (YR 1992)	9.97	1.20	2.85
Q DESIGN (YR 1992)	10.25	1.60	2.45
Q1 M.D.W.F. (YR 2020)	[illegible]	2.05	2.95
Q2 M.D.W.F. (YR 2020)	[illegible]	3.15	4.68

	q(c.f.s.)	d(ft)	v(f.p.s.)
Q1 M.D.W.F. (YR 1978)	3.70	.70	2.10
Q DESIGN (YR 1978)	9.06	1.08	2.74
Q1 M.D.W.F. (YR 1992)	9.70	1.15	2.82
Q2 DESIGN (YR 1992)	19.59	1.59	3.42
Q1 M.D.W.F. (YR 2020)	30.75	2.02	3.92
Q2 M.D.W.F. (YR 2020)	31.90	3.01	4.63

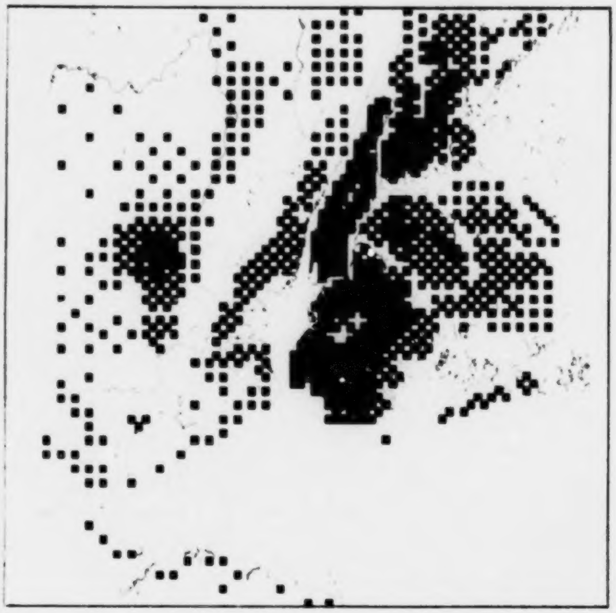
	q(c.f.s.)	d(ft)	v(f.p.s.)
Q1 M.D.W.F. (YR 1978)	4.13	.76	2.10
Q DESIGN (YR 1978)	9.83	1.15	2.71
Q1 M.D.W.F. (YR 1992)	10.20	1.21	2.79
Q2 M.D.W.F. (YR 1992)	20.40	1.68	2.18
Q1 M.D.W.F. (YR 2020)	31.4	2.10	3.78
Q2 M.D.W.F. (YR 2020)	31.92	2.12	4.51

	q(c.f.s.)	d(ft)	v(f.p.s.)
Q1 M.D.W.F. (YR 1978)	12.36	1.20	2.20
Q2 M.D.W.F. (YR 1978)	26.73	1.60	2.80
Q1 M.D.W.F. (YR 1992)	41.16	2.05	3.31
Q2 M.D.W.F. (YR 1992)	52.32	3.03	4.07
Q1 M.D.W.F. (YR 2020)	[illegible]	3.39	4.26
Q2 M.D.W.F. (YR 2020)	103.63	5.27	5.07

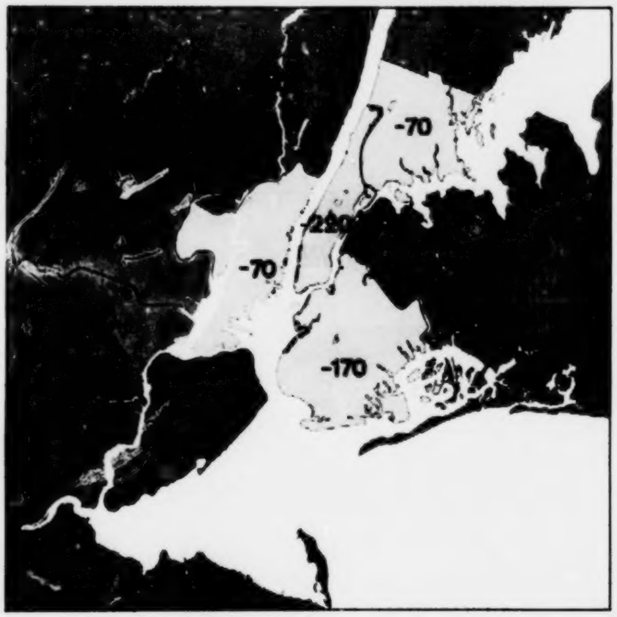
	q(c.f.s.)	d(ft)	v(f.p.s.)
Q1 M.D.W.F. (YR 1978)	14.04	1.25	2.33
Q2 M.D.W.F. (YR 1978)	28.07	1.71	2.89
Q1 M.D.W.F. (YR 1992)	43.44	2.15	3.36
Q2 M.D.W.F. (YR 1992)	64.89	3.18	4.12
Q1 M.D.W.F. (YR 2020)	[illegible]	3.56	4.25
Q2 M.D.W.F. (YR 2020)	202.72	5.50	5.07


0.47
I.E.-18.33
I.E.-19.23
I.E.-19.91
I.E.-21.63
I.E.-23.72
I.E.-27.46
℄ M.H. NO. 72
℄ M.H. NO. 73
℄ M.H. NO. 77
℄ M.H. NO. 84
END OF CONTRACT GC
R.C. PIPE
.00101
-36" DIA. R.C. PIPE
L=740.26'
S=0.000927
8'-0"W.×7'-0"H. R.C. MON. INT. SEWER
L=3139.87'
S=0.000358
8'-0"W.×7'-0"H. R.C. MON. INT. SEWER
L=5837.13'
S=0.000340
CONTRACT GB
CONTRACT GC
15,000
16,000
17,000
18,000
19,000
20,000
21,000
22,000
23,000
24,000
24,410.36 FT.

Population

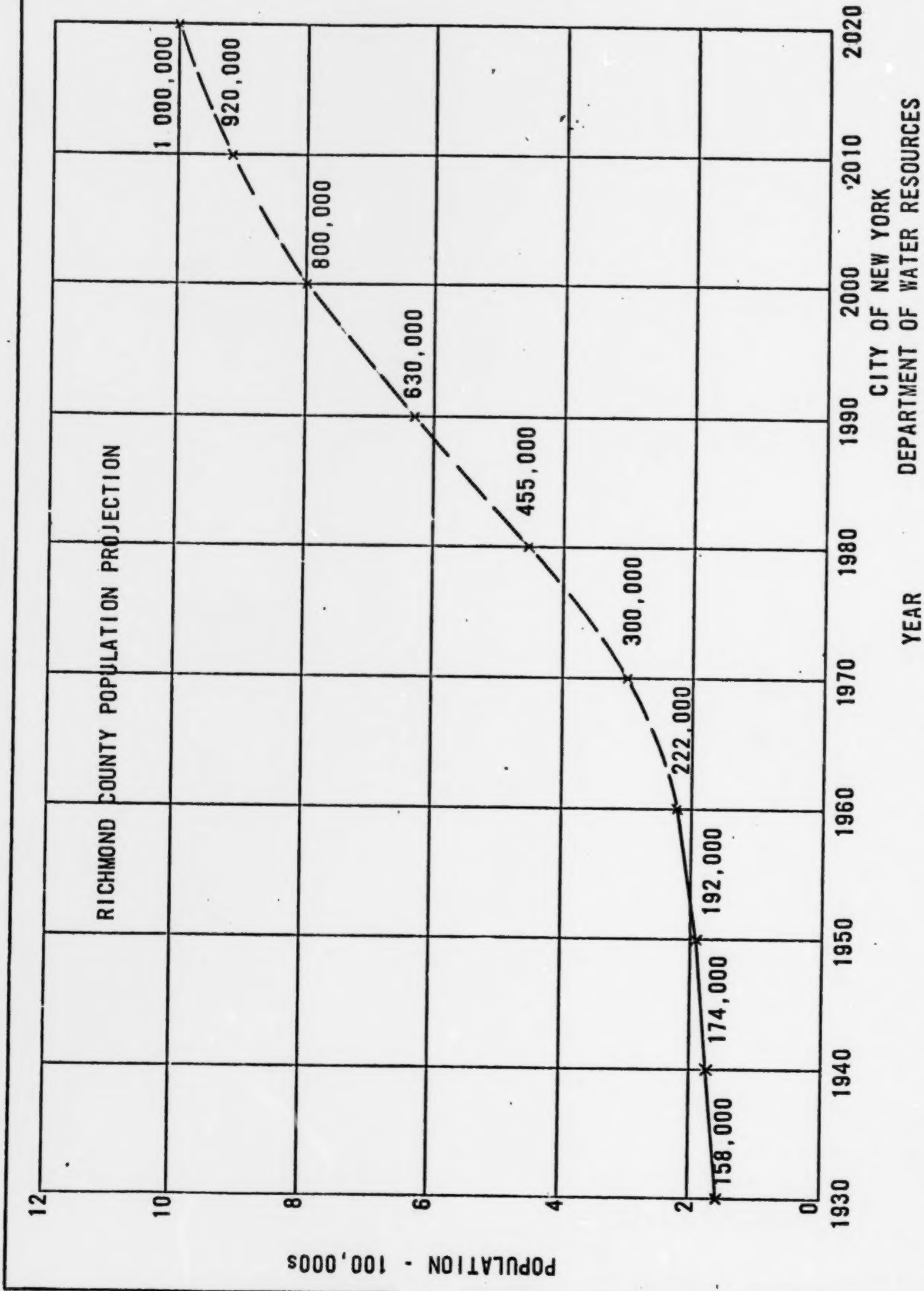

KEY
■ APPROXIMATELY 10,000 PEOPLE

POPULATION OF NEW YORK METROPOLITAN REGION *The population of Staten Island is far less dense than other areas of comparable distance from Manhattan in the metropolitan region.*


-70
-220
-70
-170
KEY
UNITS OF 1,000 PEOPLE
-220 POPULATION DECREASE
■ POPULATION INCREASE

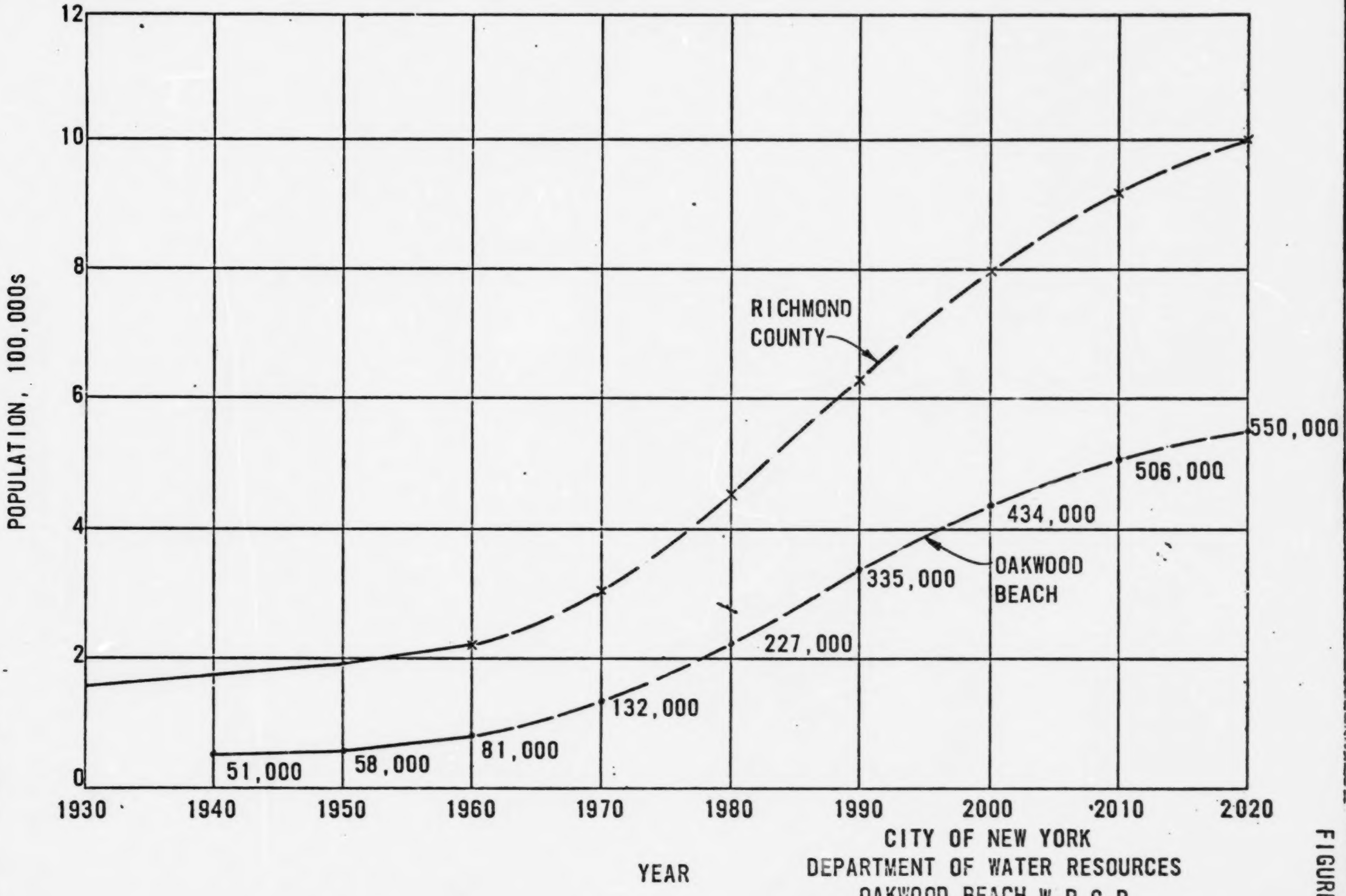
POPULATION CHANGES IN NEW YORK METROPOLITAN REGION 1950-1970 *In general, the population of the inner City has declined while that of outlying areas has increased. The population of Staten Island has increased, but not as dramatically as other comparable areas.*

FIGURE 3



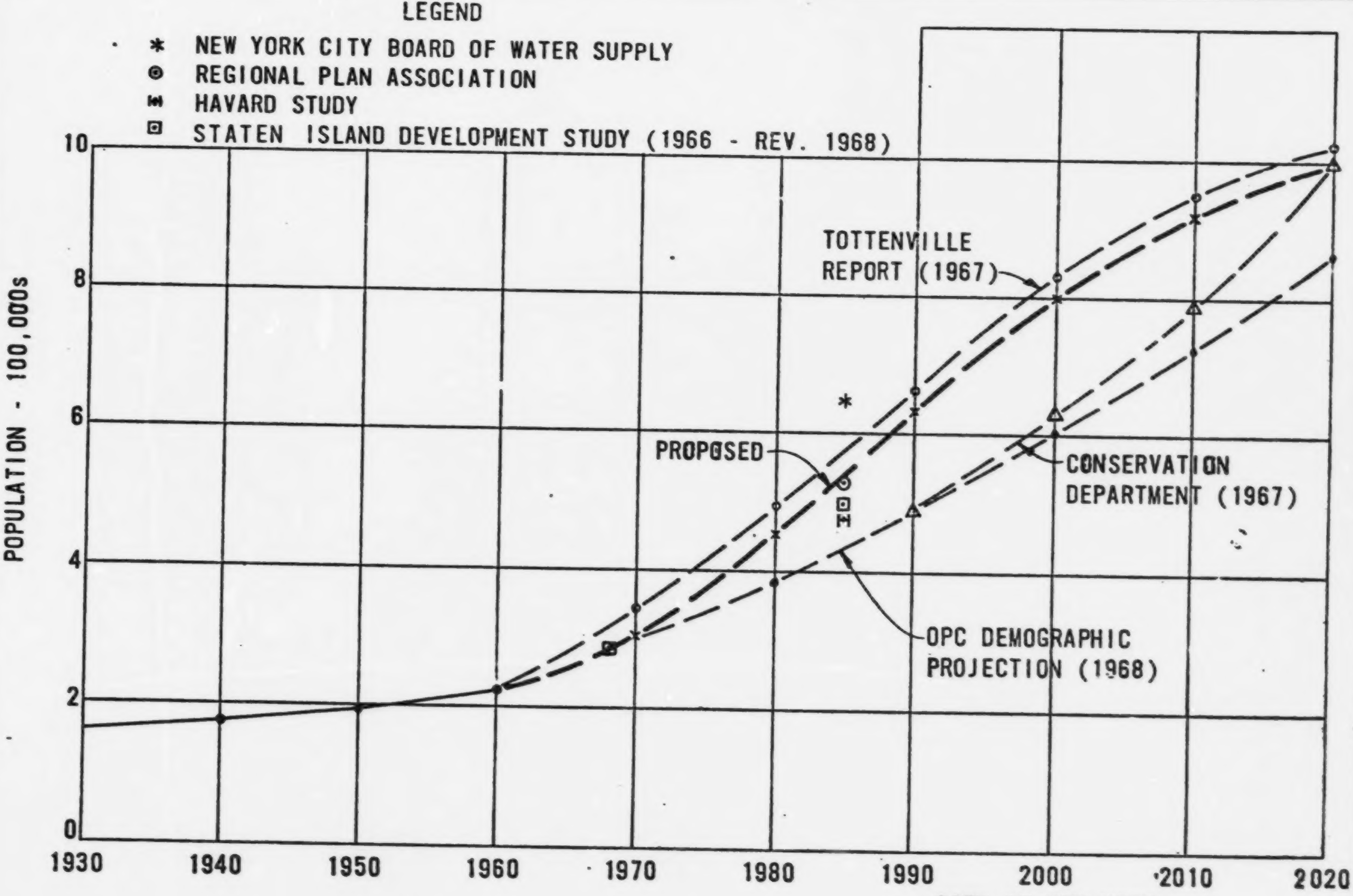
CITY OF NEW YORK
DEPARTMENT OF WATER RESOURCES
OAKWOOD BEACH W.P.C.P.

FIGURE 5



CITY OF NEW YORK
DEPARTMENT OF WATER RESOURCES
OAKWOOD BEACH W.P.C.P.
PROJECTED POPULATION - OAKWOOD BEACH.

GREELEY & HANSEN

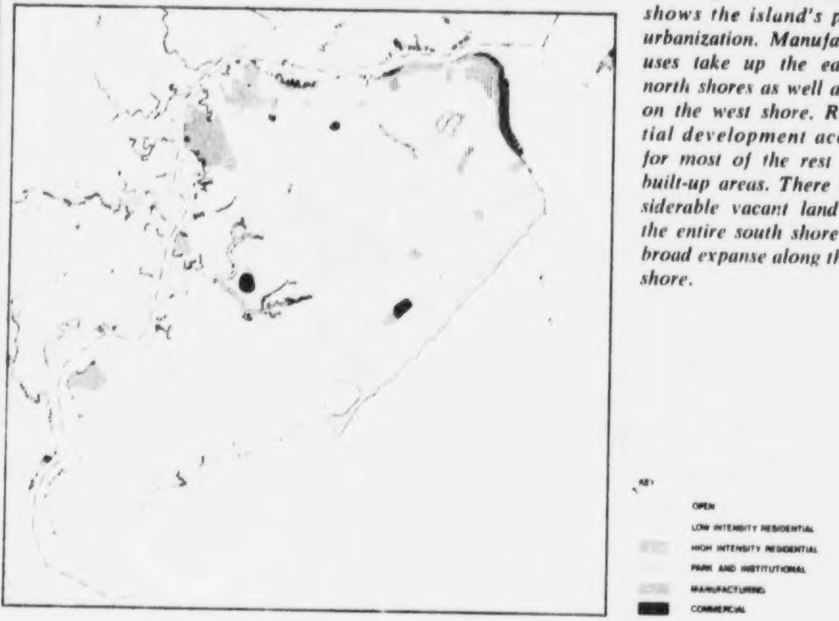


CITY OF NEW YORK
DEPARTMENT OF WATER RESOURCES
OAKWOOD BEACH W.P.C.P.
POPULATION PROJECTION - STATEN ISLAND

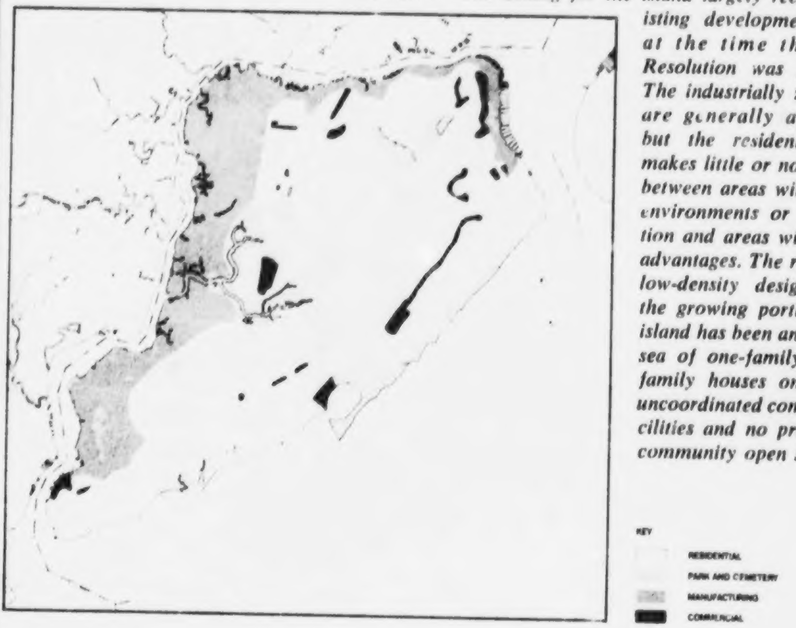
GREELEY & HANSEN

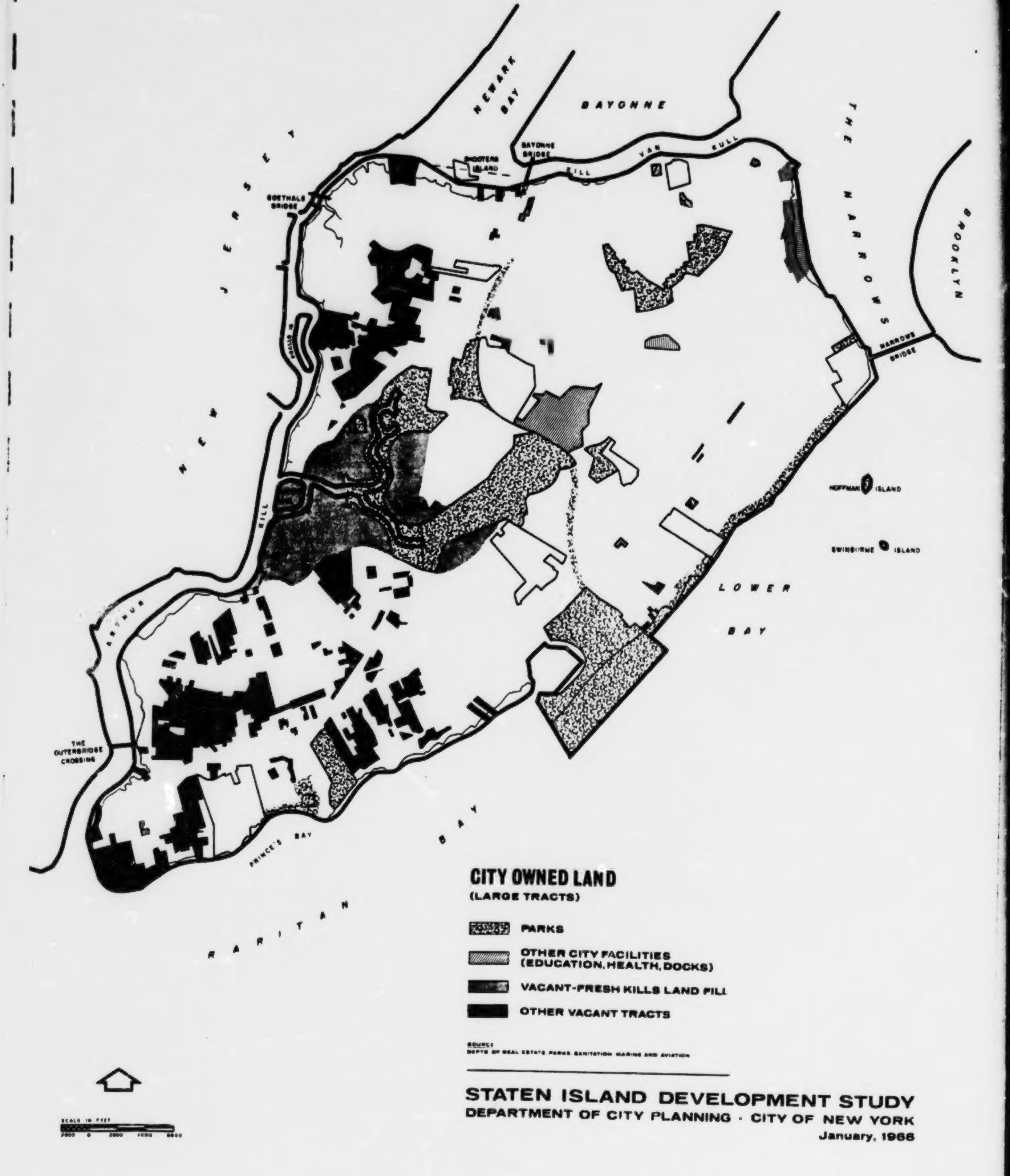
Land Resources

EXISTING LAND USE *The existing land use diagram shows the island's present urbanization. Manufacturing uses take up the east and north shores as well as spots on the west shore. Residential development accounts for most of the rest of the built-up areas. There is considerable vacant land along the entire south shore and a broad expanse along the west shore.*


KEY
OPEN
LOW INTENSITY RESIDENTIAL
HIGH INTENSITY RESIDENTIAL
PARK AND INSTITUTIONAL
MANUFACTURING
COMMERCIAL

ZONING *The zoning for the island largely recognized existing development patterns at the time the Zoning Resolution was formulated. The industrially zoned areas are generally appropriate.. but the residential zoning makes little or no distinction between areas with excellent environments or transportation and areas without these advantages. The result of the low-density designation for the growing portions of the island has been an unrelieved sea of one-family and two-family houses on tiny lots, uncoordinated community facilities and no provision for community open space.*

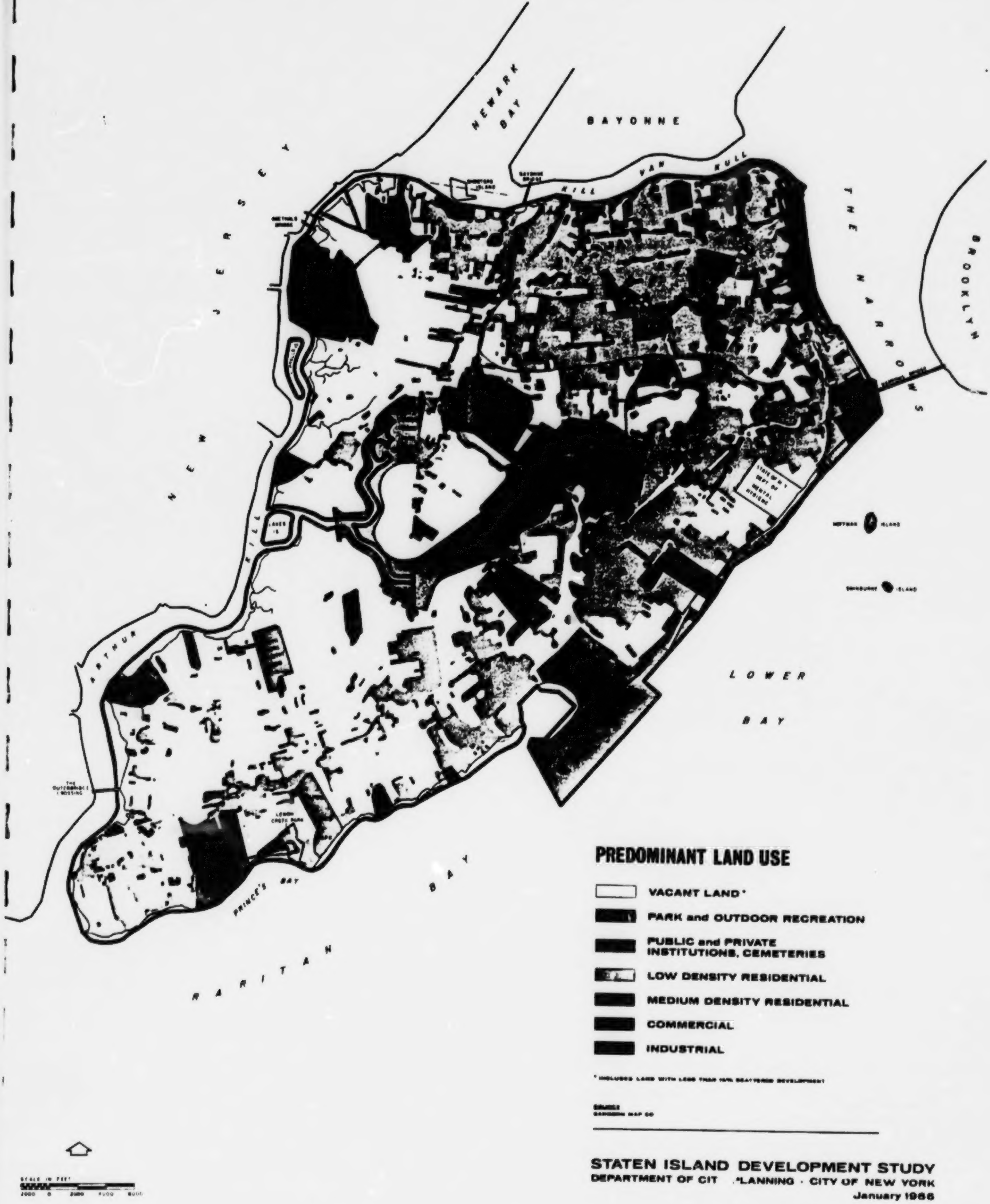

KEY
RESIDENTIAL
PARK AND CEMETERY
MANUFACTURING
COMMERCIAL


NEWARK BAY
BAYONNE
THE NARROWS
BROOKLYN
NEW JERSEY
KILL VAN KULL
SHOOTERS ISLAND
BAYONNE BRIDGE
GOETHALS BRIDGE
ARTHUR KILL
THE OUTERBRIDGE CROSSING
NARROWS BRIDGE
HOFFMAN ISLAND
SWINBURNE ISLAND
LOWER BAY
PRINCE'S BAY
RARITAN BAY
PARKS
OTHER CITY FACILITIES (EDUCATION, HEALTH, DOCKS)
VACANT-FRESH KILLS LAND FILL
OTHER VACANT TRACTS
SCALE IN FEET
2000 0 2000 4000 6000

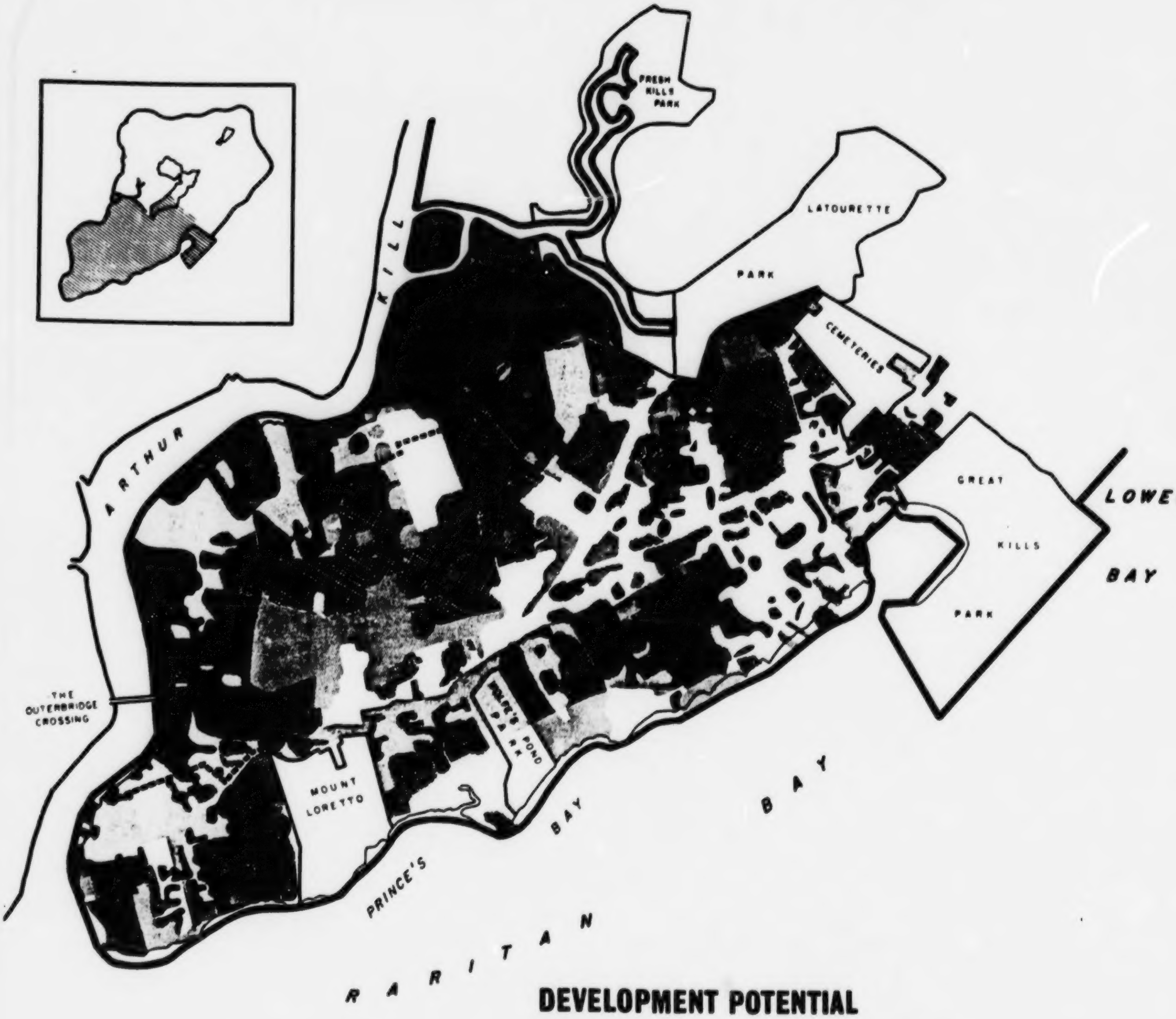
CITY OWNED LAND
(LARGE TRACTS)

SOURCE:
DEPTS OF REAL ESTATE PARKS SANITATION MARINE AND AVIATION

STATEN ISLAND DEVELOPMENT STUDY
DEPARTMENT OF CITY PLANNING · CITY OF NEW YORK
January, 1966


NEWARK BAY
BAYONNE
KILL VAN KULL
THE NARROWS
BROOKLYN
NEW JERSEY
GOETHALS BRIDGE
SHOOTERS ISLAND
BAYONNE BRIDGE
ARTHUR KILL
PRALLS IS
STATE OF N.Y. DEPT OF MENTAL HYGIENE
HOFFMAN ISLAND
SWINBURNE ISLAND
LOWER BAY
THE OUTERBRIDGE CROSSING
LEMON CREEK PARK
PRINCE'S BAY
RARITAN BAY
PREDOMINANT LAND USE
VACANT LAND*
PARK and OUTDOOR RECREATION
PUBLIC and PRIVATE INSTITUTIONS, CEMETERIES
LOW DENSITY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
COMMERCIAL
INDUSTRIAL
* INCLUDES LAND WITH LESS THAN 10% SCATTERED DEVELOPMENT
SOURCE
SCALE IN FEET
2000 0 2000 4000 6000

STATEN ISLAND DEVELOPMENT STUDY
DEPARTMENT OF CIT .'LANNING · CITY OF NEW YORK
January 1966


FRESH KILLS PARK
LATOURETTE PARK
CEMETERIES
GREAT KILLS PARK
LOWER BAY
ARTHUR KILL
THE OUTERBRIDGE CROSSING
MOUNT LORETTO
WOLFE'S POND PARK
PRINCE'S BAY
RARITAN BAY
SCALE IN FEET
2000 0 2000 4000 6000

DEVELOPMENT POTENTIAL

VACANT LAND and MAPPING STATUS
(Generalized Areas)

- ▨ Predominantly Vacant-City Owned
- ■ Predominantly Vacant-Private
- ■ Blocks Within Which 5 or More Dwellings Were Built Since 1960
- ☐ Unmapped Areas
- ☐ Parks and Areas Developed Before 1960
- -------- Zoning Boundary For Manufacturing Districts

SOURCE DEPTS OF CITY PLANNING, REAL ESTATE

SOUTH RICHMOND

STATEN ISLAND DEVELOPMENT STUDY
DEPARTMENT OF CITY PLANNING · CITY OF NEW YORK
January, 1966

PUBLIC PARKS *The City's extensive park network on Staten Island is made up overwhelmingly of large holdings generally distant from the most developed parts of the island. Park holdings, nonetheless, represent a valuable land resource.*

SANITARY LANDFILL *Sanitary landfill operations covering 2,800 acres of marshland along the Arthur Kill have been under way for several years. More than 10,000 tons of refuse per day are dumped here. The quality of the resulting land makes anything but low-intensity industry and recreation infeasible.*

RICHMOND (STATEN ISLAND)
NEW DWELLING UNITS COMPLETED, 1921 - 1940

Year	Grand Total	Total			Private		
		Public	Publicly Aided	Private	1 Family	2 Family	3 or more Family
1921 - 1930	18,250	0	0	18,250	14,552	2,808	890
1921	2,594	0	0	2,594	2,594	0	0
22	2,392	0	0	2,392	2,392	0	0
23	2,675	0	0	2,675	1,663	838	174
24	2,608	0	0	2,608	1,847	652	109
25	1,676	0	0	1,676	1,332	276	68
1926	1,508	0	0	1,508	1,300	196	12
27	1,567	0	0	1,567	1,258	242	67
28	1,541	0	0	1,541	1,229	252	60
29	1,283	0	0	1,283	733	180	370
30	406	0	0	406	204	172	30
1931 - 1940	3,127	0	0	3,127	2,073	674	380
1931	775	0	0	775	359	330	86
32	410	0	0	410	182	44	184
33	183	0	0	183	151	32	0
34	104	0	0	104	90	14	0
35	189	0	0	189	175	14	0
1936	271	0	0	271	189	82	0
37	391	0	0	391	275	68	48
38	283	0	0	283	259	24	0
39	211	0	0	211	179	32	0
40	310	0	0	310	214	34	62

RICHMOND (STATEN ISLAND)
NEW DWELLING UNITS COMPLETED, 1941 - 1960

Year	Grand Total	Total			Private		
		Public	Publicly Aided	Private	1 Family	2 Family	3 or more Family
1941 - 1950	3,917	669	0	3,248	2,053	850	345
1941	342	0	0	342	216	66	60
42	378*	0	0	378*	186	120*	72
43	508*	360*	0	148	44	104	0
44	10	0	0	10	10	0	0
45	12	0	0	12	12	0	0
1946	101	0	0	101	93	8	0
47	234	0	0	234	146	88	0
48	486	0	0	486	226	122	138
49	491	0	0	491	395	78	18
50	1,355	309	0	1,046	725	264	57
1951 - 1960	12,299	1,728	0	10,571	7,966	1,934	671
1951	2,262	1,121	0	1,141	481	222	438
52	661	0	0	661	505	86	70
53	757	0	0	757	656	102	3
54	1,102	288	0	814	712	102	0
55	1,053	319	0	734	641	86	7
1956	931	0	0	931	803	128	0
57	1,438	0	0	1,438	1,172	266	0
58	1,246	0	0	1,246	1,030	216	0
59	1,558	0	0	1,558	1,059	358	141
60	1,291	0	0	1,291	908	368	15

RICHMOND (STATEN ISLAND)
NEW DWELLING UNITS COMPLETED, 1961 - 1972

Year	Grand Total	Total			Private		
		Public	Publicly Aided	Private	1 Family	2 Family	3 or more Family
1961 - 1970	26,464	1,816	2,474	22,174	11,684	7,518	2,972
1961	1,152	0	0	1,152	834	248	70
62	2,677	693	0	1,984	1,425	338	221
63	2,423	490	0	1,933	1,212	408	313
64	2,182	489	0	1,693	1,085	344	264
65	2,319	32	366	1,921	1,332	258	331
1966	2,242	112	0	2,130	1,052	368	710
67	3,069	0	781	2,288	987	930	371
68	3,030	0	373	2,657	1,206	1,206	245
69	3,768	0	654	3,114	1,210	1,726	176
70	3,602	0	300	3,302	1,341	1,692	269
1971	2,909	0	431	2,478	1,094	1,194	290
1972	3,203	380	0	2,823	1,003	1,274	546

	Zoning District	Population Per Acre
R1-1	(single family)	25
R1-2	(single family)	30
R2	(single family)	40
R3-1	(single & two family)	60
R3-2	(multi-family - 2 story)	70
R4	(multi-family - 2 story)	85
R5	(multi-story)	130
R6	(multi-story)	250
R7	(multi-story)	350
R8	(multi-story)	500
R9	(multi-story)	625
R10	(multi-story)	850

Estimated Maximum Population Potential for the Borough of Richmond

Zoning Classification	Acreage	Maximum Population Per Acre	Total Population
R1-1	800	25	2,000
R1-2	1,500	30	45,000
R2	600	40	24,000
R3-1	1,600	60	96,000
R3-2	16,300	70	1,141,000
R4	600	85	51,000
R5	1,400	130	182,000
R6	200	250	50,000
	23,000		1,591,000

POINT SYSTEM - APPLIES TO ALL "DEVELOPMENTS"

At least one point in each of the Required Services categories and a total of twenty overall is required.

REQUIRED SERVICES

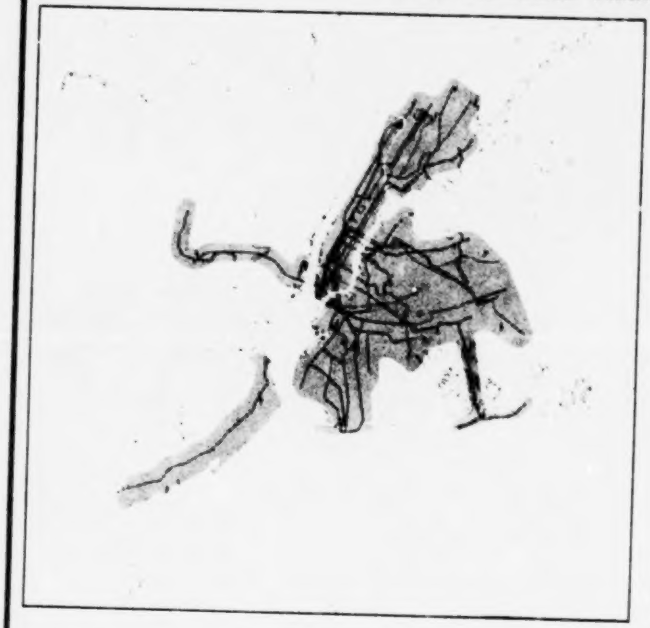
1. Storm Drainage
   - Connection to municipal storm drainage system........................5
   - Drainage to stream with adequate capacity or to a pond within development...1
2. Sanitary System
   - Connection to municipal sanitary sewer system........................5
   - Connection to private treatment plant...............................5
   - Septic tank, single family or private treatment plant (on 10,000 square foot lots)..3
3. Schools - New development cannot generate more students than seats available in the school being considered.
   - a) K-5 within 1/2 mile...5
     - K-5 within 3/4 mile...3
     - K-5 access by school bus, no unit more than 1/4 mile from bus stop..1
   - b) 6-8 within 1 mile...5
     - 6-8 within 1 1/2 miles...3
     - 6-8 access by mass transit, no unit more than 1/2 mile from transit stop..1
4. Street System
   - Collector or arterial within 1/4 mile of every unit..................3
   - Access to developed mapped street.....................................1
5. Parks - Park or playground being considered must have an available area of 350 square feet per dwelling unit being produced.
   - Developed park within 1/2 mile of every unit.........................3
   - Common open space of 350 sq. ft./dwelling unit within 1/2 mile.......1

ELECTIVE POINTS - Facilities Within 1/2 Mile of Every Unit

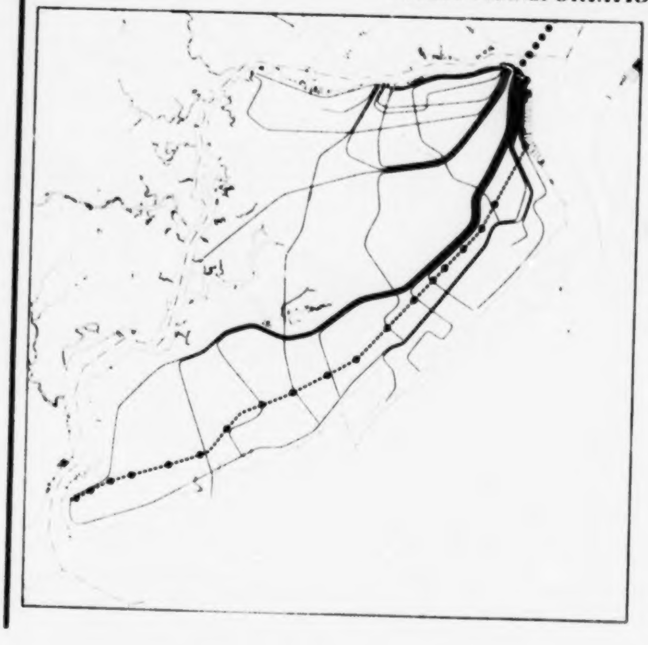
1. (C1-C2 uses) neighborhood shopping....................................1
2. Indoor recreation facilities...1
3. Libraries..1
4. Religious facilities with community services or community center, day care center, multi-service center...............................1

Mass Transportation

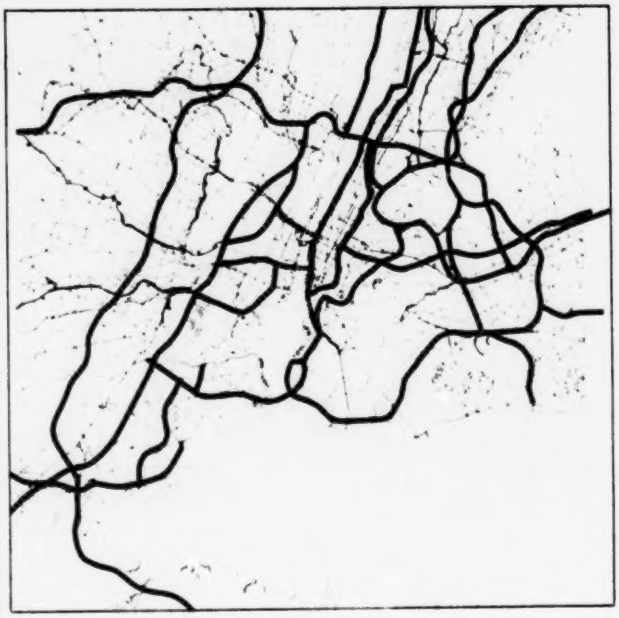
REGIONAL RAPID TRANSIT SERVICE *The regional rapid transit system's primary purpose is access to Manhattan. The other four boroughs are generally well served by the system; Staten Island and the Newark area have the basic skeleton for interregional connections.*



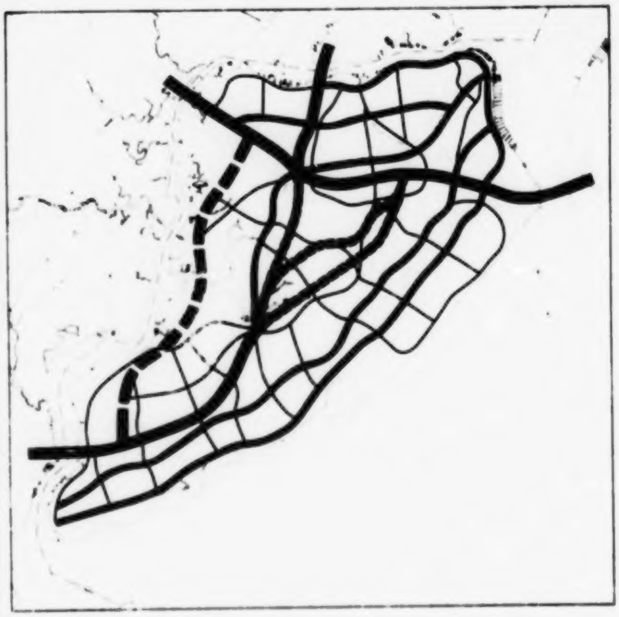
PUBLIC TRANSPORTATION SYSTEM *The public transportation system on the island is made up of the SIRT line and the bus system. The two systems (and private automobiles) converge on the St. George ferry terminal at rush hours, causing confusion that will intensify as the Manhattan-bound work force grows. The ferry has reached capacity on certain rush hour runs.*



Highways



REGIONAL ARTERIAL HIGH[illegible] SYSTEM *Staten Islan[illegible]imary regional connectio[illegible]he Staten Island Expressw[illegible] connecting the New Jersey Turnpike to Brooklyn's Belt Parkway and Gowanus Expressway. An additional regional link will be formed when the West Shore Expressway is completed in 1973, connecting the Staten Island Expressway to the Outerbridge Crossing and points south.*



HIGHWAYS AND MAJOR STREETS *Limited-access highways and primary and secondary arterial streets provide a natural hierarchy of traffic use. This hierarchy, which assigns traffic according to type (through, island, local), must be further strengthened and clarified. The limited-access highways must be emphasized as through-island routes. The primary arterial streets must carry the bulk of island traffic much more satisfactorily than they presently do, and the secondary arterial streets must serve as conveniently spaced feeders to the primary system.*

KEY

▬	LIMITED ACCESS
▬ ▬	UNDER CONSTRUCTION
▪▪▪▪	PROPOSED
▬	PRIMARY ARTERIAL
—	SECONDARY ARTERIAL

Ocean County, New Jersey

1 Introduction

1.1 Project Description

Ocean County is a sparsely settled area two hours south of New York City via the Garden State Parkway. Within commuting distance from Ocean County are Philadelphia, Pennsylvania, and Camden and Trenton, New Jersey. Once primarily a recreational area dependent upon the summer tourists, Ocean County is quickly turning into a sprawling bedroom community.

In addition to a still rapidly growing summer resort population, Ocean County experienced a 91.2% increase in permanent population between 1950-1960 and a 92.6% increase between 1960 and 1970 for a 1970 population of 208,470.[1] As the industrial center of New Jersey has sprawled into Monmouth County directly to the north. Ocean County, with large amounts of vacant, gently rolling land and forty miles of coastal recreation area, has opened up as the prime area for development.

In order to promote the regional collection and treatment of wastewater generated from the expanding populace, and in order to maintain the clean waterways necessary for continued recreational use, the Ocean County Sewerage Authority (OCSA) was founded in 1970.

---

[1] Ocean County Population, Ocean County Planning Board, January 3, 1972.

Under the management of the OCSA, the Ocean County Regional Sewerage System divides the area up into Northern, Central, and Southern Service Areas. Each service area is designed independently of the other, each with its own interceptor sewer system and regional wastewater treatment facility.

Many bids are already out in the Northern Service Area (NSA) and two large EPA grants have just been received for the Southern Service Area (SSA). In the NSA, much project construction is already underway with operations scheduled to begin in late 1975. The SSA is at least a year behind and is slated for completion in late 1976 or early 1977. The Central Service Area (CSA) is in the early process of responding to an EPA Environmental Impact Statement and has not received any construction funding. Therefore, this report will discuss only the Northern and Southern Service Area projects.*

1.1.1 Description of the Northern Service Area

The Northern Service Area contains about 110 square miles and all or part of these municipalities: Bay Head, Brick, Howell, Jackson, Lakewood, Point Pleasant, Point Pleasant Beach, Freehold, and Wall; Freehold, Howell, and Wall being part of Monmouth Country.

1973
MASTER PLAN FOR WASTEWATER MANAGEMENT
OCEAN COUNTY NEW JERSEY

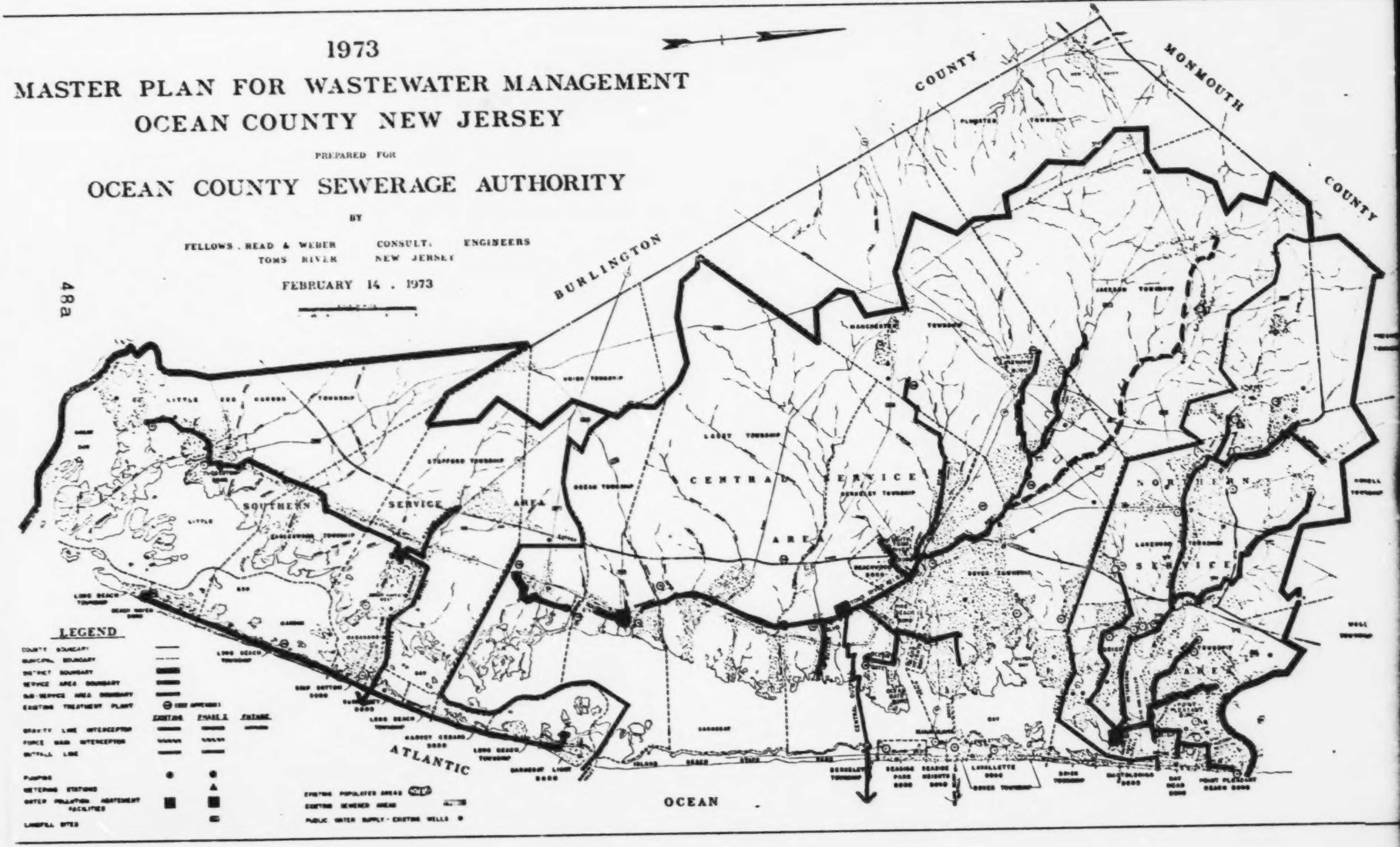
PREPARED FOR

OCEAN COUNTY SEWERAGE AUTHORITY

BY

FELLOWS, READ & WEBER CONSULT. ENGINEERS
TOMS RIVER NEW JERSEY

FEBRUARY 14, 1973


MONMOUTH COUNTY
BURLINGTON COUNTY
ATLANTIC OCEAN
CENTRAL SERVICE AREA
SOUTHERN SERVICE AREA
NORTHERN SERVICE AREA
LEGEND
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
DISTRICT BOUNDARY
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SEE APPENDIX
EXISTING
PHASE I
FUTURE
GRAVITY LINE INTERCEPTOR
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PUMPING
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WATER POLLUTION ABATEMENT FACILITIES
LANDFILL SITES
EXISTING POPULATED AREAS
EXISTING SEWERED AREAS
PUBLIC WATER SUPPLY - EXISTING WELLS

There are ten major interceptors in the NSA, beginning in the western portion of the Metedeconk River Basin and proceeding downstream to a 28 MGD treatment plant located south of the Metedeconk River. From north of the river and east of Barnegat Bay, wastewater will be carried by interceptor to Wardells Neck, where it will be pumped under the Metedeconk River to the treatment plant.

1.1.2 Description of the Southern Service Area

The Southern Service Area has an area of about 125 square miles and contains some or all of the following municipalities: Barnegat Light, Beach Haven, Eagleswood, Union, Harvey Cedars, Little Egg Harbor, Long Beach Township, Ship Bottom, Stafford, Surf City, and Tuckerton.

Regional interceptors begin in the southern portion of the county in Little Egg Harbor and proceed northward to the regional wastewater treatment plant in Stafford Township. Waste flows from Long Beach Island will be transported by interceptors to a central island point. From there, they will be pumped to the Stafford treatment plant.

1.2 Project History

In the mid-1960's the State of New Jersey began moving in the direction of regional sewerage systems to handle increasing wastewater flows. Coincidently with the State concern for regionalization, the Ocean County Board of Chosen Freeholders authorized the development of a "Master Plan for Wastewater Management for Ocean County" in 1966. The prime motivating factor behind the plan development was the intense growth projected for the area and a need to protect shellfishing areas.

To operationalize the regional approach to wastewater treatment, the Ocean County Sewerage Authority was founded in July of 1970. Due to the time lag from the original master plan to the founding of the authority and due to the completion of several population and engineering studies, a second master plan was prepared and completed in March of 1973.

The 1967 plan divided Ocean County into five regional collection basins with nine treatment plants, a reduction from 46 treatment plants. All regionalization was figured according to natural ridges and basin flows. The 1973 master plan also proposed abandonment of the local treatment facilities, to be replaced with four regional treatment plants in four regions. Later revision of the 1973 master plan resulted in the current regional configuration of the Northern, Central, and Southern service areas and three regional treatment plants. This final revision meant that Long Beach Island was subsumed into the Southern region and wastewater flows pumped across the bay to the service area treatment facility.

1.3 Project Purpose

Continual growth of Ocean County has resulted in the construction of numerous package treatment plants to handle residential flows. There are presently twelve wastewater treatment plants which discharge directly into the Atlantic Ocean. Of these, eleven provide only primary treatment to remove gross solids with no secondary treatment. Other treatment plants empty into Barnegat Bay or Little Egg Harbor. With minimal outfall lines of only 1,000 feet, little dispersion of effluent takes place, resulting in the pollution of bay fishing areas.

Thus, one goal of the proposed facilities is the upgrading of inadequately treated wastewater, total elimination of wastewater flows from bays and estuaries, and restoration of shellfishing areas.

A second espoused goal of the OCSA regional system is the protection of the wetlands on the western shores of Barnegat Bay. The 1970 State of New Jersey Wetlands Act essentially restricted all development in this region for the purposes of wetlands preservation. While development appears to have been successfully halted, the area is still undergoing contamination from existing septic tanks and small treatment plants. Such pollution will be arrested with the operation of the proposed facilities.

A third goal of the system is to handle wastewater flows from the exploding population. The chart below gives projections of wastewater flows that if not handled by the OCSA regional system will be handled with septic tanks or package treatment plants installed by developers.

NSA Flow Projections (MGD)[2]

	1980	1990	2000	2010	2020
Winter	15.01	23.06	29.90	35.01	39.47
Summer	18.65	27.32	34.61	40.02	44.80

SSA Flow Projections (MGD)[3]

	1980	1990	2000	2010	2020
Winter	6.48	11.60	14.87	17.93	20.58
Summer	15.05	23.64	27.49	29.01	30.51

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[2] "Technical Report for the Northern Service Area," Fellows, Read, and Weber, Consulting Engineers, June 1973.

[3] "Technical Report for the Southern Service Area," Fellows, Read, and Weber, Consulting Engineers, May 1974.

2. Land Use Planning

2.1 Population Projections

Ocean County is currently the fastest growing county in New Jersey. In 1950 there were 56,622 persons in the county, 108,241 by 1960, and 208,470 by 1970. Density increased from 88.4 person/square mile in 1950 to 169.1 in 1960 and to 326.0 in 1970.[4]

Of the three service areas, the northern area is the most densely settled, and the central area has the greatest growth potential. To date the population influx has consisted mostly of elderly couples and young families with one or two children. A profusion of retirement communities has attracted the former group, and inexpensive homes have attracted the latter, who are willing to commute to New York City or the Northern New Jersey industrial area. The movement of industry into Monmouth County has opened up much of the northern service area to residential development. While Ocean County is the fastest growing residential county, Monmouth County is the fastest growing industrial county. Since all the industrial expansion in Monmouth County will be proceeding southward, the forecast for movement and expansion of Ocean County's population into the central and southern service area seems to be a safe one.

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[4] Ocean County Population, Ocean County Planning Board, January 1972.

2.1.1 Forecast Methods

COMPONENT METHOD--This was the primary method used for estimating future countywide population figures. It proceeds by adding the components of net natural increase to net migration over a given number of years with variables such as birth rates, death rates, and in-migration rates.

STEPDOWN METHOD--The area for which a forecast is desired is compared with the growth of a "parent" area. Its historical behavior as a percent of the parent is projected into the future. For Ocean County, an "average" of five parent areas was selected.[5]

2.1.2 Land Use Projections

Northern Service Area Projections

Of the three service areas, the NSA has had the greatest total population increase (1950-30,000, 1970-70,000). The reason for such growth stems from the migration of people in the northeast industrial sector to the less populated and cleaner Ocean County. The single most important contributing factor to this growth has been the construction of the Garden State Parkway, which has permitted reasonable access time to industrial centers to the north.

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[5] Ocean County Population, Ocean County Planning Board, Toms River, New Jersey, January 3, 1972.

All municipalities in the NSA are undergoing high growth, with the exception of Bay Head, Mantoloking, and Point Pleasant, three areas already densely settled to the ocean coast.

For the entire northern service area (including parts of Monmouth County) the projections are as follows.[6]

1970: 106,400
1980: 173,500
1990: 246,000
2000: 308,000
2010: 357,000
2020: 402,000

Growth in Brick, Lakewood, and Howell Townships should taper off around 1990, as most of their open land should be developed by then. Point Pleasant population has already stabilized, but there remains a good number of building lots for expansion. Jackson Township is primarily undeveloped but should grow quickly with construction of I-195 and the Turnpike Spur. The Turnpike Spur and I-195 will also place Lakewood, Freehold, and Howell within commuting distance of the Trenton-New Brunswick area. Brick, Bay Head, Point Pleasant Borough, Mantoloking, and Point

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[6] "Technical Report for the Northern Service Area", Fellows, Read, and Weber, Contulting Engineers, June 1973.

Pleasant Beach have large winter/summer fluctuations. The summer increases in Brick and Point Pleasant are expected to decline as more summer residences are converted to year round dwellings.

Important growth factors for NSA include the following:

1. Very moderately priced housing ($29,000 and up) that requires very low construction costs, with mortgages @8.5%.
2. Migration of senior citizens to retirement communities.
3. Recreational attractions: bays, rivers, ocean, parks, and privately owned land not yet developed.
4. Major transportation arteries slated for development:
    a. I-195, linking NSA with Trenton;
    b. The Turnpike Spur, linking the New Jersey Turnpike at Bound Brook with the Garden State Parkway at Toms River;
    c. Dualization of Route 9 from Freehold to Lakewood, dualization of Route 20 linking the NSA with Philadelphia-Camden;
    d. Extension of commuter rail service south from Red Bank to Lakewood, New Jersey.

Population projections for the NSA derived by Fellows, Read, and Weber, the consulting engineers, were based on past and present growth rates, present land use and zoning, present and proposed transportation facilities, and probable trends in the economy.

The figures arrived at herein are corroborated by good agreement with those of the Ocean County Planning Board, the Environmental Protection Agency, the New Jersey State Department of State and Regional Planning, and the Environmental Assessment Council. Interviews with state and local officials indicated little if any disagreement with the figures.

Once the population figures were established and the pipes sized accordingly, there was little change based on population uncertainty (only one pipe size revision being made on the basis of new residential plans). All pipe sizes have remained fairly constant as all concerned officials feel the population projections be reached. The only conjectural topic is the actual time period for achieving the projected figures.

Southern Service Area Projections

Population growth in the SSA has received much closer scrutiny than that of the NSA due to the issuance of an EPA notice of intent to proceed with an Environmental Impact Statement. This intent was subsequently rescinded on the basis of further inquiries by the EPA.

The concern by the EPA did prompt the Division of State and Regional Planning, New Jersey Department of Community to publish "An Analysis of Residential Development in Ocean County in the Central and Southern Sewer Service Areas."

The SSA is made up of a sparsely settled mainland and a heavily settled beach area (Long Beach Island), implying a mainland limit to all future development. Any development on Long Beach Island must be preceeded by a zoning change.

Compared to the rest of Ocean County, the southern mainland has experienced little growth, Manahawkin and Tuckerton being the main areas to develop. Most of the building to date has been of the single-family, summer dwelling variety. Conversion of the dwellings to year round occupancy is now being influenced by the Atlantic City Expressway and Route 72.

Despite the restriction on wetlands development, the mainland peak population is expected to increase from a 1970 population of 25,000 to a 2020 population of 203,000.[7]

SSA Mainland Year-Round & Seasonal Growth Projections

	1970	1980	1990	2000	2010	2020
Winter	9,550	52,400	98,400	124,000	149,000	172,100
Summer	25,000	82,000	150,000	167,000	185,000	203,000
			Long Beach Island			
Winter	12,260	20,515	25,900	29,830	33,715	37,685
Summer	81,740	93,845	107,940	113,830	118,715	125,610

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[7] "Technical Report for the Southern Service Area,", Fellows, Read, and Weber, Consulting Engineers, May 1974.

Totals

	1970	1980	1990	2000	2010	2020
Winter	21,810	72,915	124,300	153,830	182,715	209,865
Summer	106,740	175,845	257,940	280,830	303,715	328,610

2.2 Land Use Projections

Large-scale residential development for Ocean County appears inevitable as huge development corporations own contiguous plots of land ranging from 2,000 to 10,000)00 acres. Some of these holdings represent investments on the order of 400 million dollars in land that was purchased at very low cost in the late 1950's and early 1960's.

Most of the residential development to date has taken place in the NSA and has only recently started to penetrate into the CSA. As shown in Figure III D-1, the urbanization has straddled Route 9 and the Garden State Parkway from the northern boundary of the NSA down to the Toms River Area. As shown in this same figure, this area should be completely saturated with homes and commercial areas by 1990. One can also see the linear extension of this development right down to the southernmost county boundaries.

Most land west of the Garden State Parkway in the CSA and the SSA should remain stable, as it is part of the federal, state and county land system (see Figure IIB-3).

Similarly, the land on the western shore of Barnegat Bay and Little Egg Harbor should remain stable with the enforcement of the 1970 Wetlands Act.

There is a marked absence of any industrial development in forecasted land use. The combined total commercial and industrial acreage amounts to only 2.0% of the total county area, or about 8,550 acres. This trend could change with tax problems incurred by an entirely residential area. Some county administrators have begun encouraging light industry to move into the area in an effort to reduce wintertime unemployment (about 8.5% countywide) and to broaden the tax base. The tax base problem could be especially intense in areas near retirement communities and where seasonal dwelling units are being converted to year round use. Both year round and seasonal dwelling units are taxed at the same rate, meaning no increased municipal income with a higher year round population. But the conversion of these dwelling units will put greater demands on social services and school systems, the latter in some cases being nonexistent. Parenthetically, it appears that this problem of the tax base and community services has not been considered in population projections or land use development. It would appear that if taxes get too high, that alone could act as a disincentive to prospective residents. This tax problem could be compounded should the tax rate get moderately high but be supportative of only mediocre school systems and unreliable community services.

Of the total land area in Ocean County, 408,950 acres, 162,325 remained undeveloped and in private ownership as of 1973. The twelve-year period from 1962-1973 showed a doubling in residential acreage, a growth which is tapering off as more municipalities become cognizant of the undesirable aspects of uncontrolled and rapid development. The CSA municipalities have become most sensitive to such problems and are becoming increasingly strict with developers. The NSA is practically a closed case, as most of the area is already developed. Municipalities in the SSA face the most severe challenge, as they have not yet had to face the development problems of the other two service areas, but will face them by 1990.

Considering the recent population growth and the acreage developed or planned for residential use, those 162,325 acres of privately-owned land assuredly support long-term population growth. Vacant available land is no constraint in development, especially considering the proximity of these lands to major highways and highway expansions.

2.3 Changing Land Use Characteristics

Historically the population of Ocean County has been concentrated in the Island Beach area, Lakewood, Toms River, Point Pleasant, and other small village centers.

Over the last twenty years, developments have occurred in the form of single-family units on lots of 20,000 square feet or less. Housing characteristics have thus changed from concentrated high-density housing to expansive medium and low density. This trend, according to current zoning configurations, will continue along the Garden State Parkway, as most development is projected in the low to medium density range for the exploding population.

In addition to the expansive single-family home developments, there are a substantial number of adult communities and garden apartments either under construction or currently being planned for the NSA and SSA.

2.4 Land Use Controls

A large part of the problem with the entire Ocean County growth phenomenon is the lack of adequate land use control. According to current regulations, the only regulatory bodies with direct land use control are the local municipalities. At the federal level, the EPA may require land use constraints in order to meet environmental standards. Yet, they have no enforcement capability outside of air quality degradation. As is the case with the Ocean County CSA projects, the EPA may withhold construction grant funds if the proposed project will result in a "significant" contravention of air quality standards. However, this situation has not occurred in the NSA or SSA. Since no direct jurisdictional controls exist over land use, so that in exercising powers to improve water quality, the secondary and tertiary effects on land use are ignored.

On the state level, the A-95 clearinghouse for the State of New Jersey is only an administrative body with no powers of land use control. The New Jersey State Department of Environmental Control is in a similar dilemma, as once they have decided on water and quality standards, they have no control over the methods by which a program meets those standards.

At the regional level, the OCSA can attempt to influence land use planning but is directed by law to accept all wastewater flows in their region. With such a stipulation, they have no control over land use. On the contrary, they must construct their system to handle all reasonably projected growth.

The other regional planning body is the Ocean County Planning Board. While OCPB has worked in coordination with municipalities facing development pressures, it has served solely as a source of information. Similar to EPA in its method of regulation and control, the OCPB may halt a development project on traffic circulation planning or drainage basin inadequacies. Should these problem areas not exist or be rectified by developers, OCPB has no further jurisdictional control.

This leaves direct land use control to the municipality. The problem with development to date, though, has been an absence of critical expertise on town planning boards. This was especially true in the development of the NSA. The problem has now surfaced in the CSA, where a town planning board is confronted by a well-financed developer and his staff of legal experts, engineers, economists, urban planners, etc. Historically these planning boards have been overwhelmed by such development teams, along with the threat of a lawsuit should the municipalities not comply with their wishes.

Although the CSA has recently been hard hit with development pressures, townships in this district have also shown the most increasing awareness to growth problems. After their initial experiences with the tactics of potential developers, the townships themselves have learned how to pressure developers into conforming more closely with their wishes. There have been an increasing number of court cases as municipal planning boards have refused to accede to developer pressures and have gotten a better view of how they want to develop. However, such instances have been the exception rather than the rule; the sophistication of most municipal planning boards has not increased to the extent of a highly critical examination of most development projects.

A further problem with land use controls by municipalities is the lack of understanding of the development process on the part of the planning board members. It has been the case that once the board has come to perceive the ramifications of a given development, they have hastily voted a change in zoning configurations, and are immediately faced with a lawsuit by developers. Even in rare instances where townships have given careful long-range analysis to zoning ordinances, they still may face developers' lawsuits. In an effort to maintain their solidarity, local developers have gathered into the Share Builders Association, which functions as a mutual legal aid society. In addition to the wide array of legal talent they share, whenever a given developer faces litigation, all the other developers contribute to the court costs.

2.4.1 Land Use Legislation Pertaining to Ocean County

Although land use regulations are few in number, they have delayed some development. Nevertheless, the impacts of these measures cannot halt or influence development on the

162,325 acres already in private hands and already planned for development.

The Pinelands Development District consists of about 122,000 acres in Ocean County and makes up a good portion of the CSA west of the Garden State Parkway. The Pineland Environmental Agency was created to prepare policy and programs for the protection of these natural resources and the coordinated development of the area.

Encompassing about 30% of Ocean County, the Pinelands Master Plan originally included a jetport in the western region of the CSA. This development has been dropped from the Plan, the current plan calls for the Pinelands to remain as open-space with low density residential use and natural resource protection.

Although no interceptors are planned for this region, there remain two major planning contingencies. The first question concerns those municipalities which have exclusive zoning power and whether they will restrict wholesale land development. The second question concerns the state legislature and whether they will commit the necessary financial support to acquire land and assume its protection. Should both of these questions be answered in favor of the developers, development will occur quickly. The land is gently rolling with a good water table, and construction would be merely a matter of bulldozing the pines and setting down homes.

Coastal Area Facility Review specifies an extensive list of land uses, including housing developments of 25 lots or more, which must be reviewed and approved by the NJDEP prior to construction. The Act specifically delineates the land area along the New Jersey coast; 183,000 acres of Ocean County have fallen within the perview of this legislation. Although this Act has slowed development temporarily, it cannot affect sites for which preparation had begun prior to passage of the Act. Furthermore, no new environmental standards were set in the Act. A developer must file an environmental assessment and a public hearing must be called on the Act.

The Wetlands Act of 1970 legislates that permits must be issued for all projects in the areas covered by the Act. Although this Act is being contested on constitutional grounds, it is not expected to halt any current development. It has thus far been very effective in preventing any new development plans.

3. Land Use Impact Evaluation Process

Land use impact evaluation for the OCSA Regional Sewerage System ought to be considered on at least two levels if only because of the disparate jurisdictional problems involved in land use impact evaluation.

From one perspective there is the evaluation of land use with regard to the OCSA. Since the Sewerage Authority cannot in and of itself influence land use, its responsibility is to the communities receiving the treatment facilities, i.e., their clients. The opinion of all concerned was that the OCSA did a very thorough job of making their site proposals known to all affected communities.

In an effort to issue unbiased analysis of their route proposals, the OCSA hired the Environmental Assessment Council, an independent research group, to do the independent evaluation of their project. A number of public hearings were held on the proposed sewerage system, with representatives from the OCSA, the OCPB, the consulting engineers of Fellow, Read, & Weber, and the Environmental Assessment Council to answer questions. A number of alternate interceptor routes were proposed throughout the design process. EAC evaluated all alternate proposals for the environmental impact, and Fellows, Read, & Weber did alternative costing studies. Additional comments were sought from the Ocean County Environmental Agency, a consortium of 26 smaller environmental concerns. The Ocean County Environmental Agency agreed with all final site selections and never voiced land impact opposition to the sewage system.

The effort of the OCSA to make all project and land impact information visible and well publicized was commended by a number of officials and people with environmental concerns.

From a second perspective, there is the land use impact consideration by the municipalities who will be receiving the systems and who also have direct control over land use in and around the interceptor sites. These inquiries into land use impacts during public hearings on the sewerage systems were practically non-existent. Not having had the problems of intense land development, they apparently had a difficult time even knowing the right questions to ask about land use impacts.

An additional problem in municipal planning considerations concerned the lack of board members participating in the decisions. It was not unusual for up to half the board to excuse itself from participation because they were either land holders in the project area, engineers related to project development, or realtors with their market in the project area. Hence, any potential expertise was often unavailable.

4. Influence of the Land Use Impact Evaluation Process

The concensus of state and local officials is that nothing is going to halt the development of Ocean County. Even the Impact Statement completed on the CSA is regarded only as a delay problem.

In those situations where municipal planning boards have put demands on developers for school facilities or realignment of roadways, the developers have agreed to community demands. Indeed, it was also the opinion of those people interviewed that the interceptor sewer system has had and will have no effect on development.

The developers would be quite willing to put in their own tertiary treatment facilities should the federal money be withdrawn and the municipalities demand advanced wastewater treatment. This is especially true in the CSA where the projected population growth will result in a violation of air quality standards, the reason for a delay in federal funding.

Even the Coastal Areas Facility Review Act will be a small obstacle to companies with $400 million in holdings who will not only make large profits on land sales, but will be financing the mortgages on many of the homes they build.

Basically, most land use impact evaluation has been a delaying factor for a development pattern that is perceived as inevitable.

5. Other Project Attributes Influencing Land Use

The local share of project financing will derive from the general revenues of OCSA. OCSA bills each town per million gallons of waste delivered to the system. It is then up to the towns to charge their own residents for individual waste flows. With "customers" of the system being defined as the municipalities themselves, the charge per dwelling unit must be ascertained from each of these municipalities. It is conceivable that a town looking to stem development could institute high connection fees as a deterrent to development.

defined as the municipalities themselves, the charge per dwelling unit must be ascertained from each of these municipalities. It is conceivable that a town looking to stem development could institute high connection fees as a deterrent to development.

A greater degree of regionalization would mean fewer than the three existing treatment plants now planned and many more miles of interceptor sewers. Land use in the form of medium to low density housing has already occurred prior to the OCSA Sewerage System, and any more regionalization may further spread housing developments.

Less regionalization would conform more to the current situation where there are now fifty treatment plants in the OCSA area. It is hard to conceive how any alternative between these two extremes would drastically affect development and land use patterns, considering the abundant resources of the development corporations.

From interviews with Ocean County regional and New Jersey state officials, it appears that the rapid growth projections are valid regardless of the interceptor system and treatment plant installations. Their perspective indicates that the current regional approach is merely the most cost effective way to handle an inevitable process of county growth.

APPENDIX

OCEAN COUNTY INTERCEPTORS

Sewer Contract

	Fresh Pond	Bay Avenue
	NI-11	NI-12
Length	2.9	2.59
Area Served		
Type	Gravity	Gravity
Diameter	30",36",42"	16",30",36",42"
Cost	1,973,000	2,300,000
Initial Flow	3.63	3.358
Design Year Flow	8.7 (ave.)	5.41
Capacity Flow	18.4	12.99
Peak/Ave.	2.05	2.23

	Point Pleasant Beach & Bridge Avenue	Beaver Dam
	NI-13	NI-14
Length	1.93	2.58
Area Served		
Type	Gravity	
Diameter	24",27",30"	24",30",36"
Cost	$859,000	$1,510,000
Initial Flow	1.34	1.457
Design Year Flow	1.87	3.83
Capacity Flow	6.5	15.56
Peak/Ave.	2.67	2.4

Sewer Contract

	County Line Interceptor	Aldrich
	NI-15	NI-17
Length	3.52	1.50
Area Served		
Type	Gravity	Gravity
Diameter	30",36"	21",24"
Cost	$1,602,000	$525,000
Initial Flow	.83	0.13
Design Year Flow	7.7	2.2
Capacity Flow	38.33	5.7
Peak/Ave.	2.09	2.59

	North Branch	North Branch
	NI-19	NI-20
Length	3.37	3.43
Area Served		
Type	Gravity	Gravity
Diameter	30",42"	18",24",30"
Cost	$2,207,000	$1,166,000
Initial Flow	2.3	1.10
Design Year Flow	7.4	3.47
Capacity Flow	15.93	7.96
Peak/Ave.	2.12	2.47

WASTEWATER FLOWS FOR THE OCSA SEWERAGE SYSTEM (MGD)

	1980	1990	2000	2010	2020
NSA					
Winter	15.01	23.06	29.90	35.01	39.47
Industry	1.19	1.90	2.52	2.96	3.38
Summer	2.45	2.36	2.19	2.05	3.38
Total	18.65	27.32	34.61	40.02	44.80
CSA					
Winter	20.50	30.05	42.38	49.28	55.88
Industry	1.43	3.08	3.75	4.42	5.07
Summer	4.20	4.70	5.20	5.40	5.50
Total	26.13	37.83	51.33	59.10	66.45
SSA					
Winter	7.03	11.71	14.69	17.46	19.81
Industry	-	-	-	-	-
Summer	5.91	8.28	7.92	7.40	7.04
Total	12.94	19.99	22.61	24.86	26.85

SOUTHERN SERVICE AREA INTERCEPTORS

Manahawkin Bay Crossing Interceptor & Outfall

Sewer Contracts

	SI-2	SI-3A	
Length	3.50	2.65	
Area Served			
Type	Gravity & Force Main	Force Main	
Diameter	48",54"	24",30"	
Cost	$3,662,000	$6,211,000	
Initial Flow	10.4 (ave)	-	Force Main
Design Year Flow	18.3 (ave)	-	
Capacity Flow	33.6	-	
Peak/Ave.	1.8	-	

Beach Haven West Interceptor

Sewer Contracts

	SI-1
Length	1.07
Area Served	
Type	Force Main & Gravity
Diameter	16", 24"
Cost	$203,000
Initial Flow	-
Design Year Flow	2.0
Capacity Flow	5.3 (peak)*

*capacity of initial flow not available

North Island Interceptor

Sewer Contracts

	SI-8	SI-10
Length	3.22	4.64
Area Served		
Type	Force Main & Gravity	Force Main & Gravity
Diameter	12",16"-FM 30",36"-G	4",6",21" 24",27"
Cost	$1,154,000	$1,502,000
Initial Flow	2.54	1.32
Design Year Flow	3.76	2.03
Capacity Flow	9.64	5.48
Peak/Ave.	2.4	2.6

South Island Interceptor

Sewer Contracts

	SI-9	SI-11
Length	3.52	4.79
Area Served		
Type	Gravity	Force Main & Gravity
Diameter	36",42"	8",12",16",21" 24",27",30",36"
Cost	$2,127,000	$1,973,000
Initial Flow	4.87	3.47
Design Year Flow	6.60	4.8
Capacity Flow	14.54	16.99
Peak/Ave.	2.1	2.3

Little Egg Interceptor

Sewer Contracts

	SI-5	SI-6	SI-7
Length	3.61	4.00	3.10
Area Served			
Type	Force Main & Gravity	Force Main & Gravity	Force Main & Gravity
Diameter	36",48"	20",24",30",36"	14",18",24",30"
Cost	$1,574,000	$1,464,000	$1,049,000
Initial Flow	4.4	3.0	1.6
Design Year Flow	12.6	8.5	4.6
Capacity Flow	24.6	17.8	10.6
Peak/Ave.	1.9	2.06	2.3

PROJECT COSTS AND FINANCING ARRANGEMENTS

Total Cost of Sewage Treatment Project:	$280,000,000 (estimate)
Total EPA Eligible Cost:	$240,223,000
Federal Share:	75%
State Share:	15%
Local Share (OCSA):	10%
Breakout of Interceptor Costs:	$29,737,000 (NSA)
	$37,819,000 (CSA)
	$12,623,000 (SSA)
	$80,179,000 (Total)

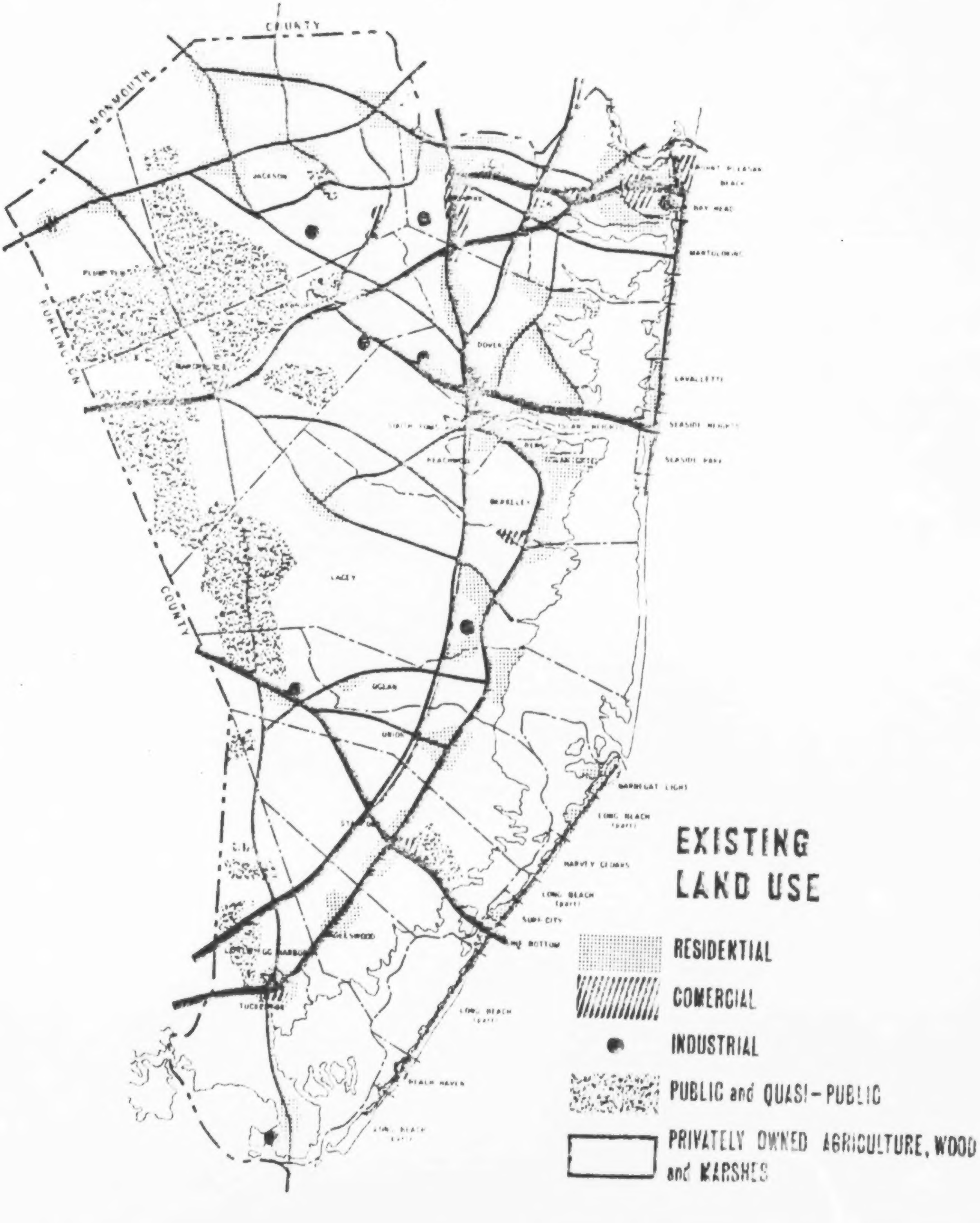
Method for Financing Local Share:

OCSA share will be financed with issuance of forty-year bonds. Since final project cost will not be determined until completion, it is likely that the project will be constructed with funds raised through short-term financing of one year notes issued to secure monies for cost defrayment. Until the project is completed, the one-year notes will be refunded when they become due and new ones issued. As parts of the construction are completed and Federal and State Grants payments are made to the OCSA, the money will be used to retire portions of the outstanding one-year notes. Upon project completion, and when Federal and State grants are paid in full, the outstanding one-year notes will be retired into forty-year long-term bonds.

User Charges:

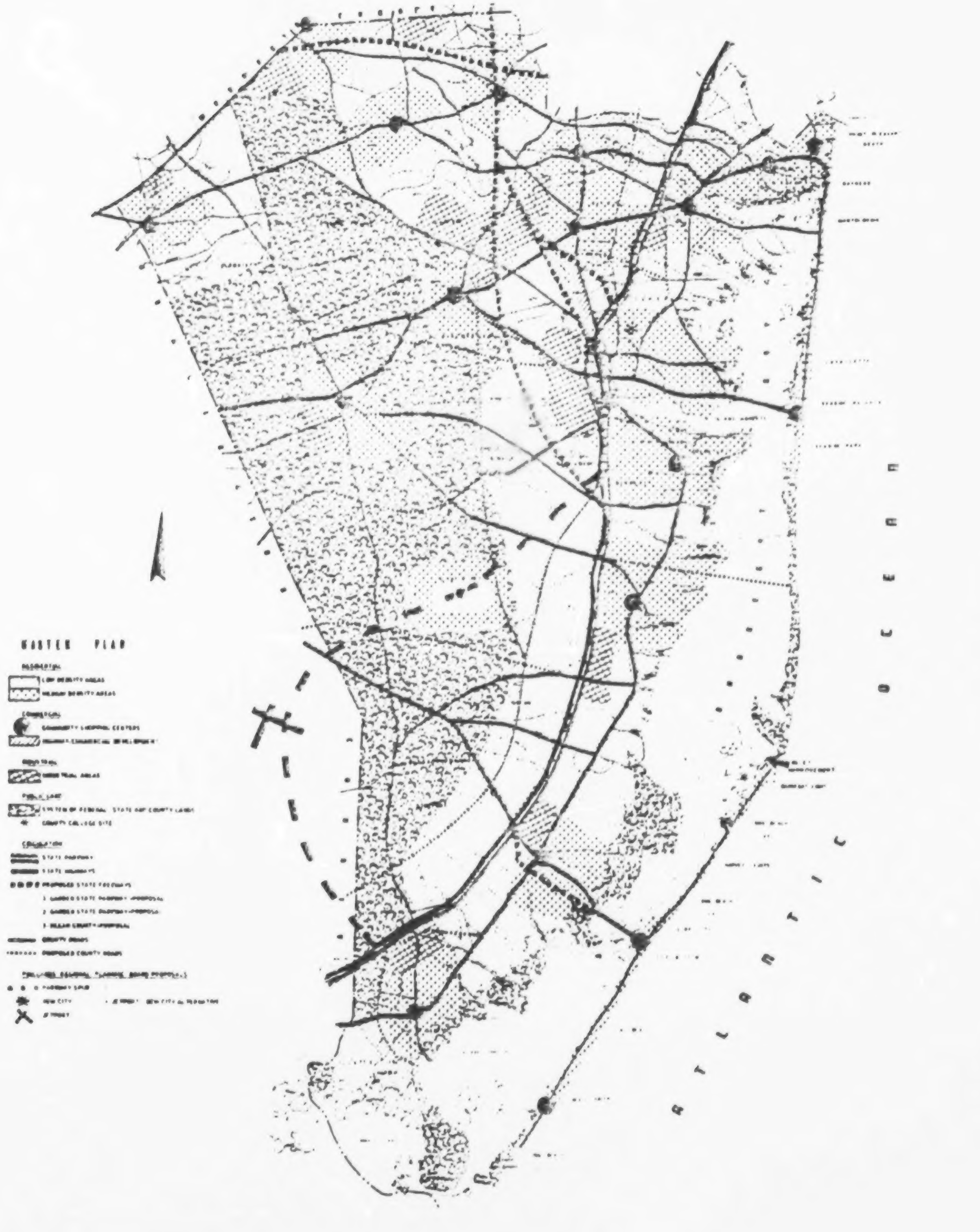
Bonds of the OCSA will be secured by revenues of the sewerage system. A service agreement with each of the participants (municipalities) provides for a single rate throughout the system based on the number of gallons processed and total cost of operating the system. The amount of money any participant may be required to pay the OCSA is determined by multiplying the rate in effect by the number of gallons contributed to the system. Customer charges within each municipality are determined by the municipality themselves.

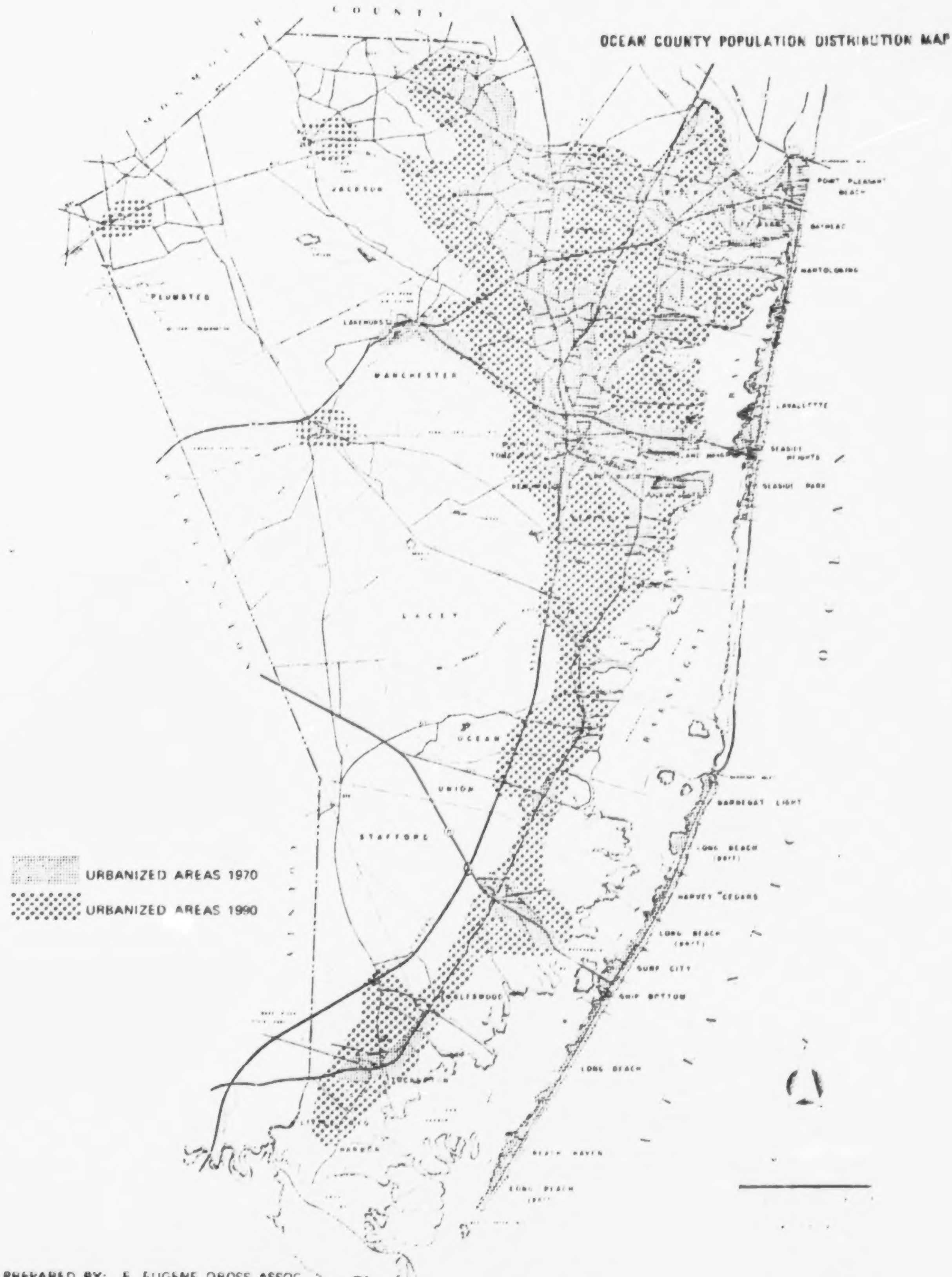
EXISTING LAND USE IN OCEAN COUNTY


COUNTY
MONMOUTH
BURLINGTON
COUNTY
JACKSON
PLUMSTED
MANCHESTER
DOVER
POINT PLEASANT BEACH
BAY HEAD
MANTOLOKING
LAVALLETTE
SEASIDE HEIGHTS
SEASIDE PARK
ISLAND HEIGHTS
BEACHWOOD
BERKELEY
LACEY
OCEAN
UNION
STAFFORD
BARNEGAT LIGHT
LONG BEACH (part)
HARVEY CEDARS
LONG BEACH (part)
SURF CITY
SHIP BOTTOM
EAGLESWOOD
LITTLE EGG HARBOR
TUCKERTON
LONG BEACH (part)
BEACH HAVEN
LONG BEACH (part)
EXISTING LAND USE
RESIDENTIAL
COMERCIAL
INDUSTRIAL
PUBLIC and QUASI-PUBLIC
PRIVATELY OWNED AGRICULTURE, WOOD and MARSHES

E. Eugene Oross Associates, Ocean County Master Plan, 1966.

FORCASTED LAND USE PATTERNS IN OCEAN COUNTY


MASTER PLAN
LOW DENSITY AREAS
MEDIUM DENSITY AREAS
COMMUNITY SHOPPING CENTERS
INDUSTRIAL AREAS
COUNTY COLLEGE SITE
STATE HIGHWAYS
PROPOSED STATE FREEWAYS
COUNTY ROADS
PROPOSED COUNTY ROADS
NEW CITY
JETPORT
ATLANTIC
OCEAN



OCEAN COUNTY POPULATION DISTRIBUTION MAP
MONMOUTH COUNTY
JACKSON
PLUMSTED
LAKEHURST
MANCHESTER
LACEY
OCEAN
UNION
STAFFORD
POINT PLEASANT BEACH
BAYHEAD
MANTOLOKING
LAVALLETTE
SEASIDE HEIGHTS
SEASIDE PARK
BARNEGAT LIGHT
LONG BEACH (TWP)
HARVEY CEDARS
LONG BEACH (TWP)
SURF CITY
SHIP BOTTOM
LONG BEACH
BEACH HAVEN
LONG BEACH (TWP)
▨ URBANIZED AREAS 1970
▩ URBANIZED AREAS 1990

PREPARED BY: E. EUGENE OROSS ASSOC

DATE: NOV 1972

SUBDIVISION AND SITE PLAN APPROVALS BY MUNICIPALITY IN THE NORTHERN SERVICE AREA

	1970	1971		
Municipality	Number of Subdivisions	Number of Subdivisions	Number of Site Plans	Number of Lots
Bay Head	2	0	0	0
Brick	82	77	56	764
Jackson	35	49	17	133
Lakewood	46	73	18	1,607
Mantoloking	0	0	0	0
Point Pleasant	26	29	9	197
Point Pleasant Beach	13	4	4	9
Totals	204	232	104	2,710

Data: Supplied by the Ocean County Planning Board.

MAJOR PLANNED DEVELOPMENT SOUTHERN SERVICE AREA*

Subdivision	Township	Planned Units	Estimated Units Built to Date	Units Remaining to be Built	Average Occupancy Per Unit	Estimated New Population	Estimated New Flow MGD
Dinner Point**	Eagleswood	9,500	0	9,500	2.85	27,075	2.70
Mystic Shores	Little Egg Harbor	1,400	0	1,400	2.0	2,800	0.28
Shady Oaks	"	1,174	0	1,174	3.5	4,100	0.41
Colonial Village	"	300	0	300	3.5	1,050	0.10
Tall Cedars	"	4,500	0	4,500	3.0	13,500	1.35
Holly Lake	"	800	0	800	3.0	2,400	0.24
Mystic Dev. Corp.**	"	7,000	3,000	4,000	3.5	14,000	1.40
Sea Wind Farms	"	900	0	900	3.5	3,150	0.32
Oak Hill	"	200	0	200	3.5	700	0.07
Paradise Cove**	"	90	0	90	3.5	315	0.03
Ardel	Stafford	7,000	0	7,000	3.5	24,500	2.45
Ocean Acres	"	4,000	200	3,800	3.5	13,300	1.33
Mo-Park	"	3,000	100	2,900	2.0	5,800	0.58
Beach Haven West**	"	8,000	3,000	5,000	3.0	15,000	1.50
Stafford Park Estates	"	5,500	0	5,500	3.5	19,250	1.92

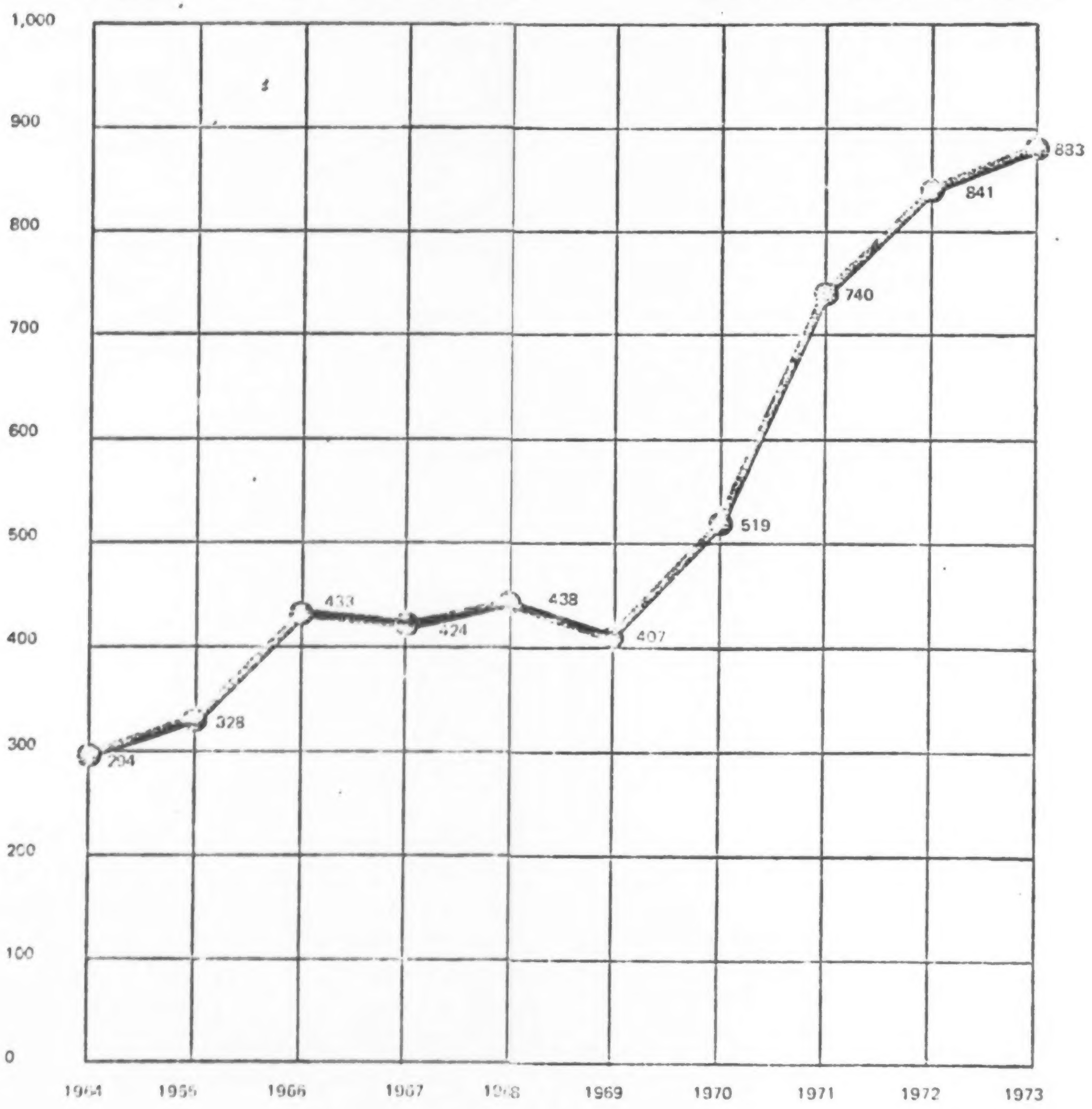
Subdivision	Township	Planned Units	Estimated Units Built to Date	Units Remaining to be Built	Average Occupancy Per Unit	Estimated New Population	Estimated New Flow MGD
Fawn Lakes	Stafford	800	0	800	3.0	2,400	0.24
Fawn Lakes	"	1,400	0	1,400	3.0	4,200	0.42

*This is a partial list of major developments now under construction or in the planning stage. The developers are confident the units will be built by 1990 and in many instances are requesting permission to construct interim treatment plants.

**Resort Housing

PRELIMINARY AND FINAL

SUBDIVISIONS APPROVED*

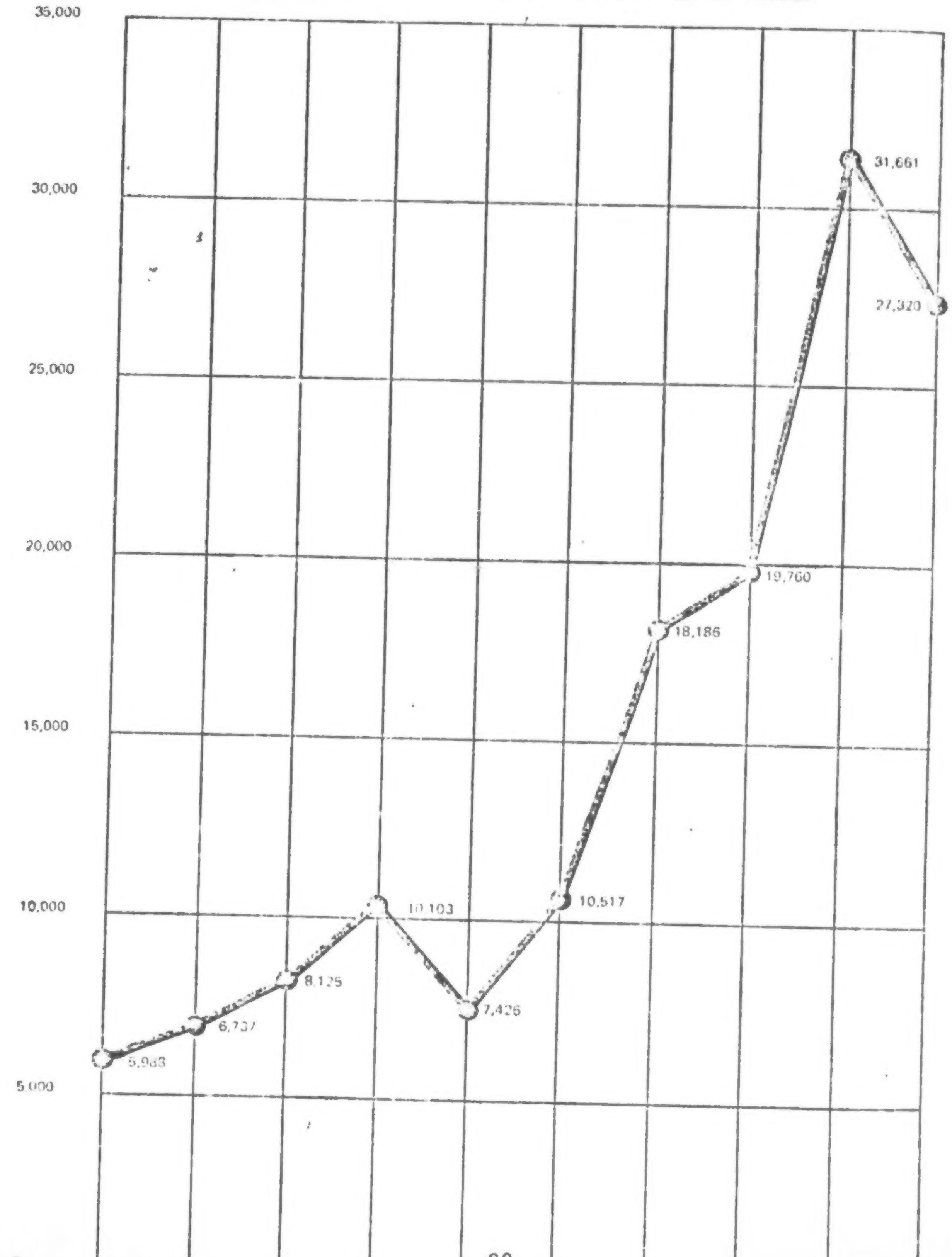


*Also includes re-approved and revised subdivisions

Source: Ocean County Planning Board

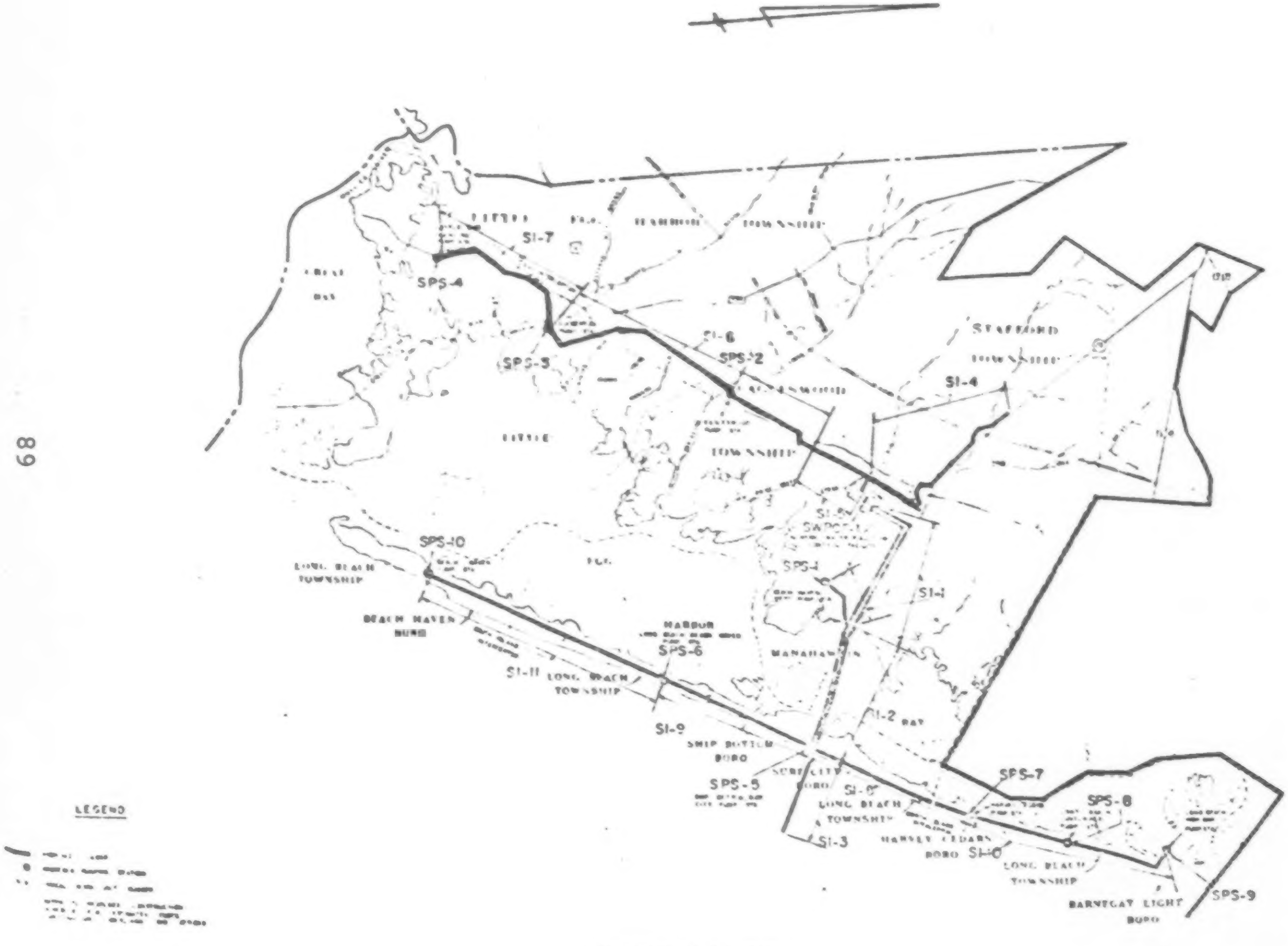
OCEAN COUNTY

LOTS APPROVED*



*Includes preliminary, final, re-approved and revised lots

Source: Ocean County Planning Board



LEGEND
LITTLE EGG HARBOR TOWNSHIP
SI-7
GREAT BAY
SPS-4
SPS-3
LITTLE EGG
SI-6
SPS-2
EAGLESWOOD
TOWNSHIP
STAFFORD TOWNSHIP
SI-4
SI-5
SWPCF
SPS-1
SI-1
MANAHAWKIN BAY
SI-2
SPS-10
LONG BEACH TOWNSHIP
BEACH HAVEN BORO
HARBOUR
SPS-6
SI-11 LONG BEACH TOWNSHIP
SI-9
SHIP BOTTOM BORO
SPS-5
SURF CITY BORO
SI-8
LONG BEACH TOWNSHIP
SI-3
HARVEY CEDARS BORO
SI-10
SPS-7
SPS-8
LONG BEACH TOWNSHIP
BARNEGAT LIGHT BORO
SPS-9

SOUTHERN SERVICE AREA

OCEAN COUNTY SEWERAGE AUTHORITY
SOUTHERN SERVICE AREA
PROPOSED WORK UNITS
DATE: FEB.73
SHT. NO.
DRN BY: E.M.
FELLOWS, READ & WEBER, INC
EXHIBIT NO.

OCEAN COUNTY'S LOCAL GROWTH

	1950	1960	1970	% Change 1960-1970	% of Ocean County Population
OCEAN COUNTY	56,622	108,241	208,470		
Barnegat Light	227	287	554	93.0	0.26
Bay Head	808	824	1,083	31.4	0.51
Beach Haven	1,050	1,041	1,488	42.9	0.71
Beachwood	1,251	2,765	4,390	58.8	2.10
Berkeley Township	1,550	4,272	7,918	85.3	3.79
Brick Township	4,319	16,299	35,057	115.1	16.81
Dover Township	7,707	17,414	43,751	151.2	20.98
Eagleswood Township	623	766	823	7.4	0.39
Harvey Cedars	106	134	314	134.3	0.67
Island Heights	795	1,150	1,397	21.5	0.67
Jackson Township	3,513	5,939	18,276	307.7	8.76
Lacey Township	966	1,940	4,616	137.9	2.21
Lakehurst	1,518	2,780	2,641	- 5.0	1.26
Lakewood Township	10,809	16,020	25,223	57.4	12.10
Lavallette	567	832	1,509	81.4	0.72
Little Egg Harbor	644	847	2,972	250.9	1.42
Long Beach Township	840	1,561	2,910	86.4	1.39
Manchester Township	1,758	3,779	7,550	99.8	3.62
Mantoloking	72	160	1,081	53.1	0.51
Ocean Gate	452	706	1,081	53.1	0.51
Ocean Township	520	921	2,222	141.3	1.06
Pine Beach	495	985	1,395	41.6	0.67
Plumstead	2,093	3,281	4,113	25.4	1.97
Pt. Pleasant Beach Borough	2,900	3,873	4,882	26.1	2.34
Seadside Heights Borough	862	954	1,248	30.8	0.59
Seaside Park Borough	987	1,054	1,432	35.9	0.68
Ship Bottom	533	717	1,079	50.5	0.51
South Toms River	492	1,603	3,981	148.3	1.90
Stafford Township	1,347	1,930	3,684	90.9	1.76
Surf City	291	419	1,129	169.5	0.54
Tuckerton	1,332	1,536	1,926	25.4	0.92
Union Township	1,173	1,270	1,539	21.2	0.73

SOURCE: 1960, 1970 Census

PROJECTED YEAR-ROUND POPULATION AND DENSITIES FOR MUNICIPALITIES, SERVICE AREAS AND DISTRICT

Municipality	Area (Square Miles)	Population in 1990	1990 Density (People Per Square Mile)	Population in 2020	2020 Density (People Per Square Mile)
Barnegat Light	.70	1,190	1,703	1,360	1,942
Bay Head	.60	1,500	2,500	2,200	3,667
Beach Haven	1.00	2,830	2,831	3,230	3,230
Beachwood	2.80	8,900	3,179	5,000	5,357
Berkeley	41.90	71,800	1,714	101,000	2,410
Brick	26.40	80,700	3,057	122,000	4,621
Dover	41.60	86,400	2,077	125,000	3,005
Eagleswood	16.50	5,500	333	20,500	1,242
Harvey Cedars	.55	750	1,354	850	1,545
Island Heights	.60	1,600	2,667	2,000	3,334
Jackson	94.80	74,000	781	158,000	1,667
Lacey	81.70	50,000	612	86,000	1,053
Lakehurst	.95	3,000	3,158	3,300	3,474
Lakewood	24.40	51,000	2,090	79,000	3,238
Lavallette	.65	2,400	3,692	3,000	4,615
Little Egg Harbor	49.50	27,500	555	50,000	1,010
Long Beach	4.30	5,800	1,351	6,630	1,542
Manchester	48.70	36,000	739	72,000	1,479
Mantoloking	.44	550	1,250	900	2,045
Ocean	20.60	15,500	752	34,000	1,650
Ocean Gate	.50	1,550	3,100	2,150	4,300
Pine Beach	.60	1,950	3,250	2,700	4,500
Point Pleasant	3.70	26,000	7,027	35,000	9,459
Point Pleasant Beach	1.50	5,500	3,666	10,300	6,867
Seaside Heights	.35	2,000	5,714	2,500	7,142
Seaside Park	.60	2,300	3,833	2,900	4,833
Ship Bottom	.71	2,090	2,938	2,380	3,352
South Toms River	1.20	5,600	4,667	6,400	5,334
Stafford	43.60	58,000	1,330	82,000	1,381

Municipality	Area (Square Miles)	Population in 1990	1990 Density (People Per Square Mile)	Population in 2020	2020 Density (People Per Square Mile)
Surf City	.65	2,240	3,438	2,550	3,923
Tuckerton	3.70	3,800	1,027	8,100	2,189
Union	23.10	16,600	719	34,500	1,493
Freehold	10.50	8,000	762	20,000	1,905
Howell	21.50	25,000	1,176	48,000	2,259
Wall	1.00	3,700	3,700	6,700	6,700
Northern Service Area	110.50	246,000	2,226	402,000	3,638
Central Service Area	323.00	317,000	981	543,000	1,681
Island Beach Ser. Area	4.1	14,600	3,561	18,300	4,463
Southern Service Area					
Mainland	126.00	98,400	779	172,100	1,363
Long Beach Island	7.90	14,900	1,886	17,000	2,152
Total Southern	134.00	113,300	846	189,100	1,411
Total District	572.00	691,000	1,208	1,152,000	2,014

NORTHERN SERVICE AREA
YEAR-ROUND GROWTH PROJECTIONS

Municipality	1950	1960	1970	1980	1990	2000	2010	2020
Bay Head	808*	824*	1,083*	1,300	1,500	1,700	2,000	2,200
Brick	3,700	15,500	34,000	57,000	79,000	97,000	110,000	120,000
Howell	4,500	7,000	12,000	18,000	25,000	33,000	40,000	48,000
Jackson	2,000	4,800	9,000	26,000	44,000	58,000	70,000	80,000
Lakewood	10,809*	16,020*	25,223*	37,000	51,000	62,000	71,000	79,000
Mantoloking	72*	160*	319*	400	550	650	800	900
Point Pleasant	4,009*	10,182*	15,968*	21,000	26,000	30,500	33,000	35,000
Pt. Pleasant Bch.	2,900*	3,873*	4,882*	5,500	7,000	8,200	9,500	10,300
Freehold	800	1,100	2,500	5,000	8,000	12,000	15,500	20,000
Wall	500	900	1,400	2,300	3,700	4,800	5,600	6,700
Totals	30,100	60,400	106,400	173,500	246,000	308,000	357,000	402,000
Percent Increase		100%	76%	63%	41%	25%	16%	12%

*Census

SOUTHERN SERVICE AREA
YEAR-ROUND & SEASONAL GROWTH PROJECTIONS

	1950	1960	1970	1980	1990	2000	2010	2020	
Eagleswood	623*	766*	823*	2,400	5,500	11,500	16,500	20,500	Winter
			2,000	8,400	24,000	26,000	28,500	31,500	Summer
Little Egg Harbor	644*	847*	2,972*	15,000	27,500	35,000	43,000	50,000	Winter
			11,500	28,000	45,500	50,000	55,000	59,000	Summer
Stafford	1,347*	1,930*	3,684*	31,000	58,000	66,000	74,000	82,000	Winter
			8,200	40,000	71,500	78,000	85,000	92,000	Summer
Tuckerton	1,332*	1,536*	1,926*	2,500	3,800	5,300	6,800	8,100	Winter
			3,100	3,900	5,500	6,600	7,900	9,100	Summer
Union	50	70	140	1,460	3,600	6,200	8,700	11,500	Winter
			140	1,460	3,600	6,200	8,700	11,500	Summer
total	4,000	5,149	9,550	52,400	98,400	124,000	149,000	172,100	Winter
			25,000	82,000	150,000	167,000	185,000	203,000	Summer

* Census

NORTHERN SERVICE AREA SEWER INTERCEPTOR DATA

Kettle Creek Interceptor

Sewer Contract

	NI-1A	NI-1B	NI-1C
Length (miles)	1.58	1.51	3.86
Type	Gravity	Gravity	Gravity
Diameter	48"	48"	36"
Cost	1,347,000	1,548,000	2,380,000
1980 Initial Flow (MGD)	3.73	3.73	1.98
2020 Design Year Flow (MGD)	10.27	10.27	5.31
Capacity Flow (MGD)	20.70	20.70	13.56
Peak/Ave.	1.99	1.99	2.13

METEDECONK RIVER CROSSING

Sewer Contract

	River Crossing	
	NI-2	NI-6
Length (miles)	2.65	.97
Area served	Interceptors	Travel under river
Type	Gravity & Force Main	Force Main
Diameter	60	20, 24, 30
Cost	$462,000	$966,000
1980 Initial Flow (MGD)	7.24	7.2"
Design Year Flow (MGD)	14.75	24.0"
Capacity Flow (MGD)	72.71	27.6"
Peak/Ave.	1.88	2.13

SOUTH BRANCH METEDECONK INTERCEPTOR$_1$

Sewer Contract

	NI-5	NI-7	NI-8	NI-9
Length (miles)	2.97	1.85	3.29	2.49
Area Served				
Type	Force Main & Gravity	Gravity	Force Main & Gravity	Force Main & Gravity
Diameter	60" & 72"	72"	60" & 66"	36,42,54,60
Cost	$2,518,000	$2,602,000	$2,991,000	$2,199,000
Initial Flow (MGD)	10.37	8.32	5.51	4.81
Design Year Flow (MGD)	36.7	34.3	23.8	21.5
Capacity Flow (MGD)	61.22	56.75	57.44	37.7
Peak/Ave.	1.6	1.26	1.72	1.77

SOUTH BRANCH METEDECONK INTERCEPTOR$_2$

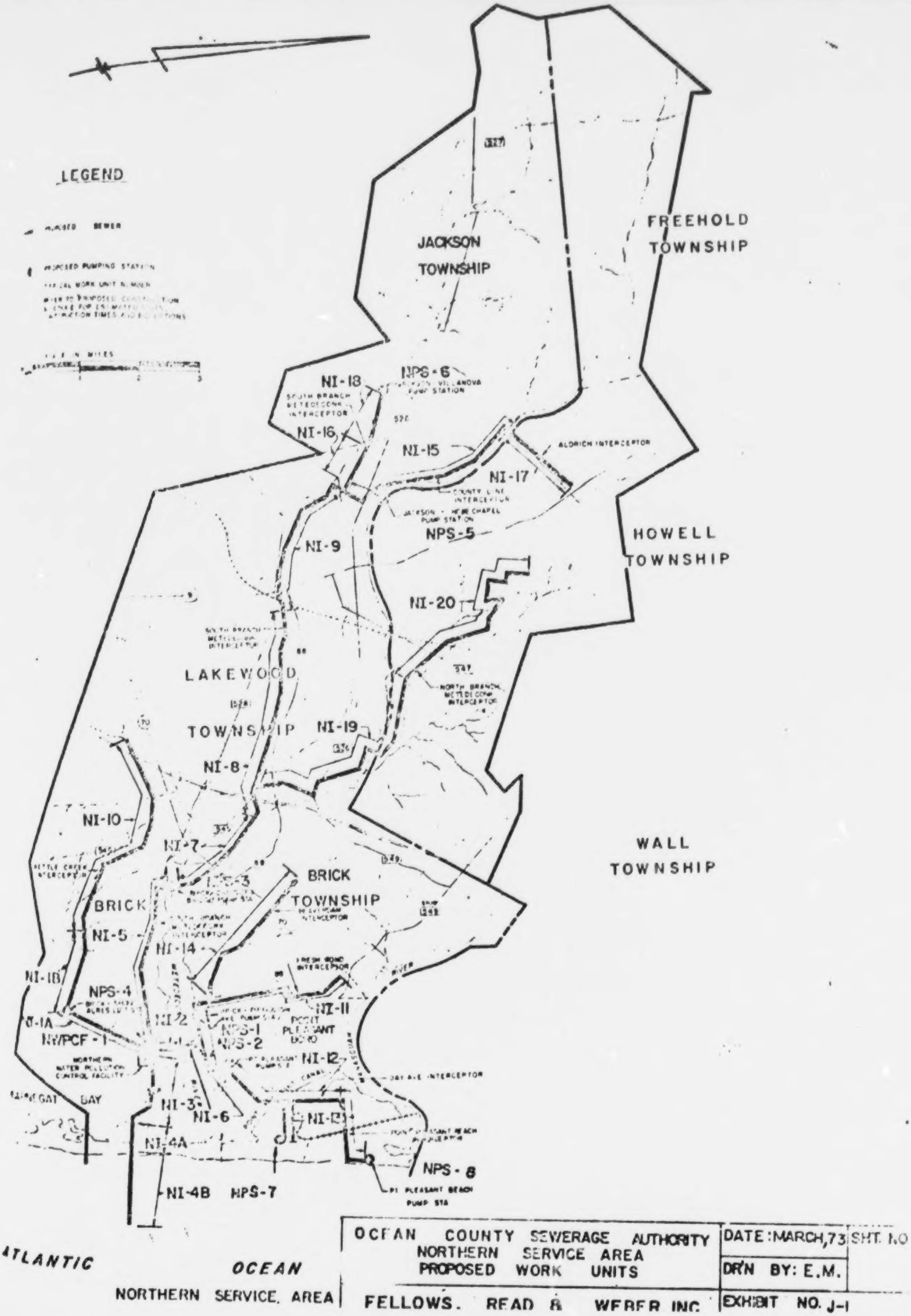
Sewer Contract

	NI-16	NI-18
Length (miles)	1.09	0.63
Area Served		
Type	Gravity	Force Main
Diameter	27" & 36"	16"
Cost	$448,000	$134,000
Initial Flow (MGD)	2.40 (ave.)	0.4 (ave.)
Design Year Flow (MGD)	10.5	Not Available
Capacity Flow (MGD)	45.63	5.4
Peak/Ave.	1.9	3.25

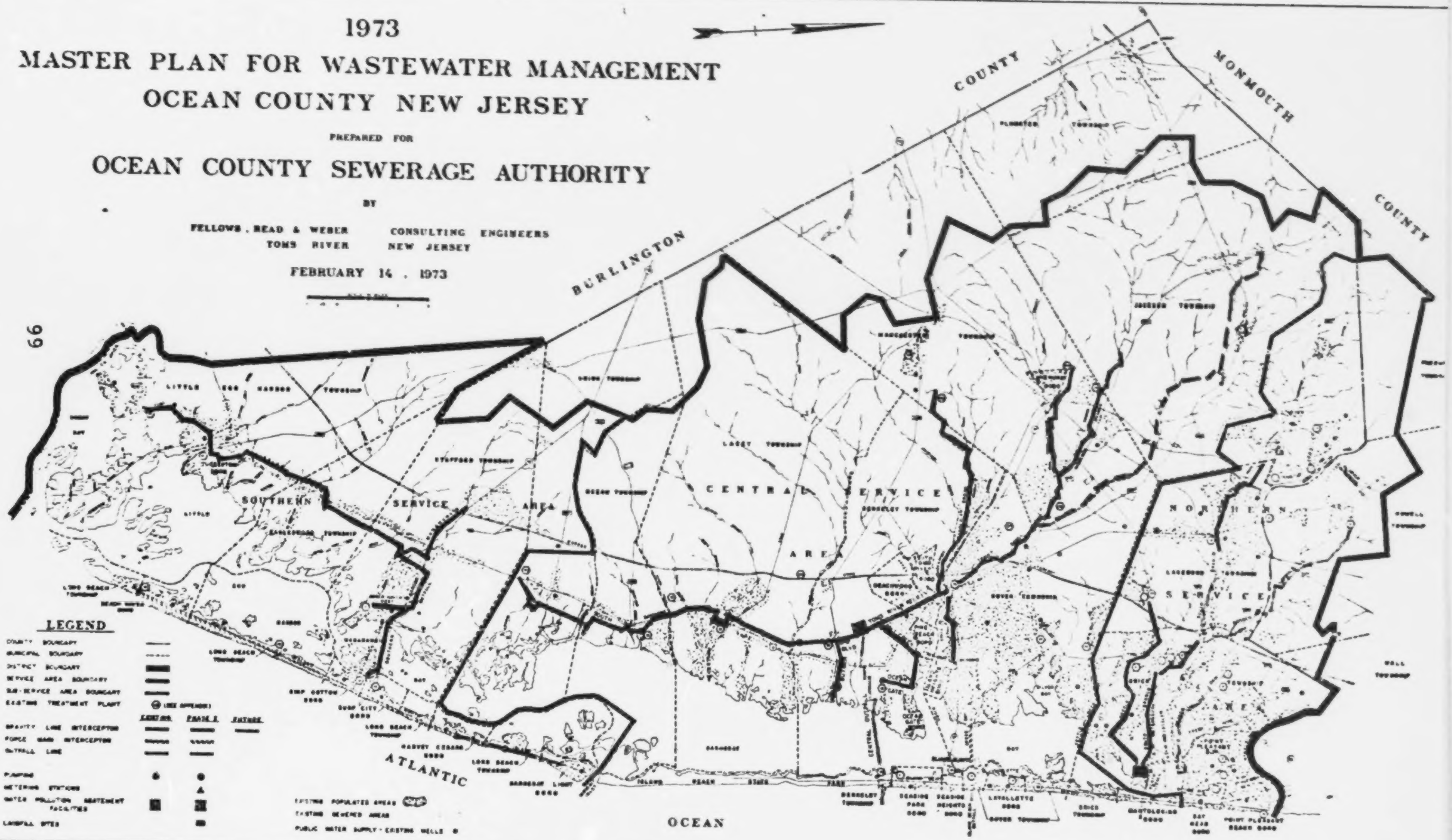
MAJOR INDUSTRIAL WASTEWATER CONTRIBUTORS
OCEAN COUNTY SEWERAGE AUTHORITY DISTRICT

Name of Firm	Plant Location	Receiving Water & Classification	Type of Products	Description of Present Discharge
Ocean County				
Borden, Inc.	Pt. Pleasant Beach	Wills Hole Thorofare TW-1	Clams	SS-200 PPM BOD_5- 342 PPM Flow - .0868 MGD BOD_5- 248 lbs./day TSS - 145 lbs./day Oil & Grease - 7 lbs./day F. Coli. - not available
Jersey Central Power & Light	Lacey Twp.	Oyster Creek TW-1	Power Generation	Information not available Flow - 529 MGD
Toms River Chemical	Toms River, Dover Twp.	Atlantic Ocean CW-2 Toms River FW-2	Dyes, Resins, Pesticides Cooling Water	TSS - 3,900 lbs./day BOD_5- 13,200 lbs./day COD - 31,300 lbs./day Ammonia (N) - 825 lbs./day Cadium - 1.1 lbs./day Chromium - 26.2 lbs./day Copper - 36.7 lbs./day Lead - 14.7 lbs./day Mercury - 0.15 lbs./day Zinc - 26.3 lbs./day Chlorinated Hydrocarbons - 6,150 lbs./day Nitrobenzene - 132 lbs./day Nickel - 10.8 lbs./day Phenol - 3.0 lbs./day

Reference: "Pre-Conference Report for Water Quality Standards Setting/Revision Conference New Jersey Atlantic Coastal Area, May, 1972"


LEGEND
SEWER
PROPOSED PUMPING STATION
WORK UNIT NUMBER
1
2
3
JACKSON TOWNSHIP
FREEHOLD TOWNSHIP
NI-18
NPS-6
VILLANOVA PUMP STATION
SOUTH BRANCH METEDECONK INTERCEPTOR
NI-16
NI-15
ALDRICH INTERCEPTOR
NI-17
COUNTY LINE INTERCEPTOR
JACKSON - NEW CHAPEL PUMP STATION
NPS-5
HOWELL TOWNSHIP
NI-9
NI-20
SOUTH BRANCH METEDECONK INTERCEPTOR
NORTH BRANCH METEDECONK INTERCEPTOR
LAKEWOOD TOWNSHIP
NI-19
NI-8
NI-10
NI-7
KETTLE CREEK INTERCEPTOR
NPS-3
BRICK TOWNSHIP
WALL TOWNSHIP
BRICK
NI-5
NI-14
NI-1B
NPS-4
FRESH POND INTERCEPTOR
NI-11
NI-1A
NI-2
NPS-1
NPS-2
POINT PLEASANT BORO
NI-12
NW/PCF-1
NORTHERN WATER POLLUTION CONTROL FACILITY
BAY AVE INTERCEPTOR
BARNEGAT BAY
NI-3
NI-6
NI-13
NI-4A
NPS-8
NI-4B
NPS-7
PT. PLEASANT BEACH PUMP STA
RIVER
ATLANTIC OCEAN
NORTHERN SERVICE AREA

OCEAN COUNTY SEWERAGE AUTHORITY NORTHERN SERVICE AREA PROPOSED WORK UNITS	DATE: MARCH, 73	SHT. NO
	DR'N BY: E.M.	
FELLOWS, READ & WEBER INC	EXHIBIT NO. J-1	



1973

MASTER PLAN FOR WASTEWATER MANAGEMENT
OCEAN COUNTY NEW JERSEY

PREPARED FOR

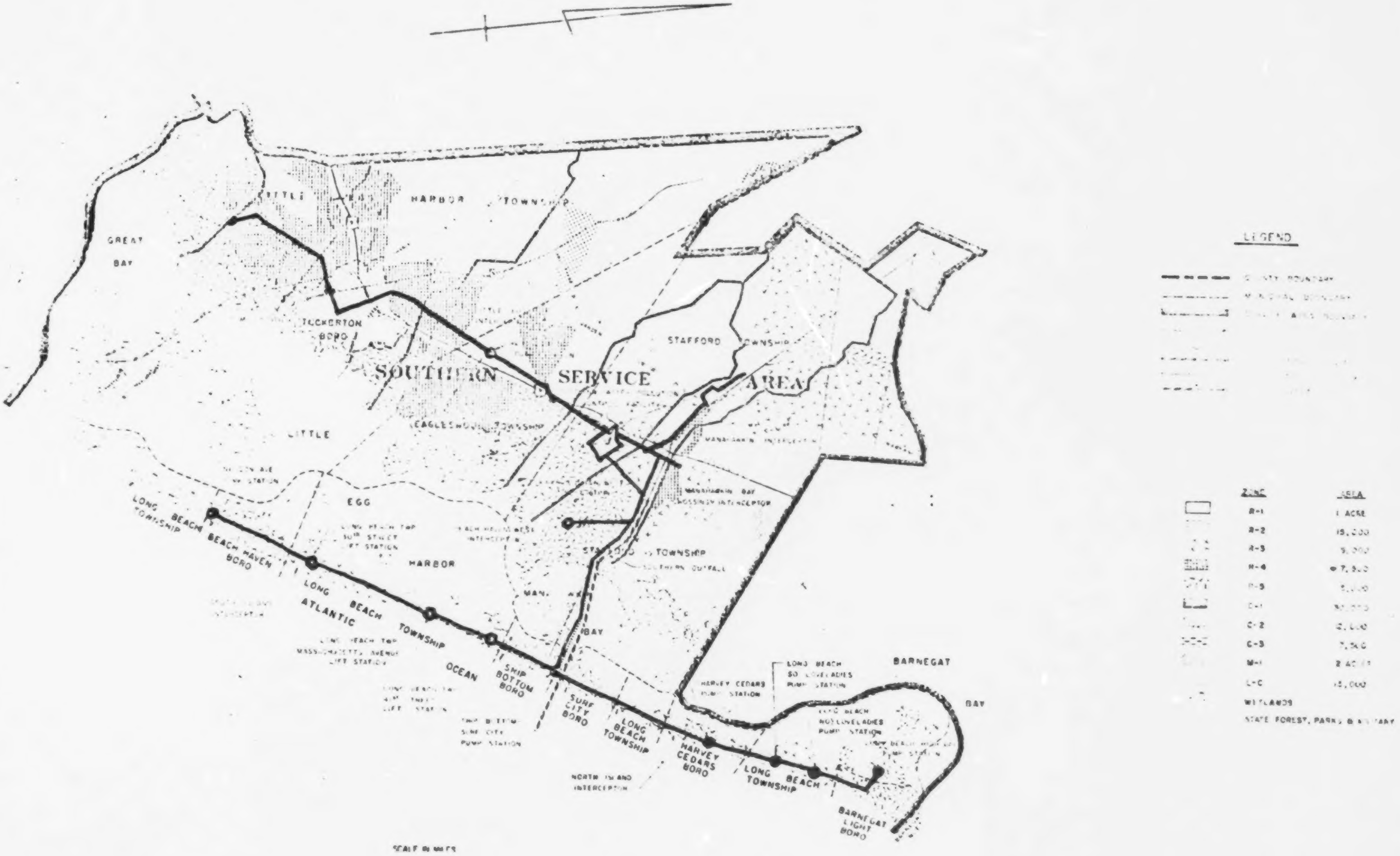
OCEAN COUNTY SEWERAGE AUTHORITY

BY

FELLOWS, READ & WEBER CONSULTING ENGINEERS
TOMS RIVER NEW JERSEY

FEBRUARY 14, 1973

BURLINGTON COUNTY
MONMOUTH COUNTY
ATLANTIC OCEAN
SOUTHERN SERVICE AREA
CENTRAL SERVICE AREA
NORTHERN SERVICE AREA
LITTLE EGG HARBOR TOWNSHIP
STAFFORD TOWNSHIP
OCEAN TOWNSHIP
LACEY TOWNSHIP
BERKELEY TOWNSHIP
JACKSON TOWNSHIP
PLUMSTED TOWNSHIP
MANCHESTER TOWNSHIP
DOVER TOWNSHIP
LAKEWOOD TOWNSHIP
HOWELL TOWNSHIP
WALL TOWNSHIP
EAGLESWOOD TOWNSHIP
LONG BEACH TOWNSHIP
BEACH HAVEN BORO
SHIP BOTTOM BORO
SURF CITY BORO
HARVEY CEDARS BORO
BARNEGAT LIGHT BORO
ISLAND BEACH STATE PARK
BERKELEY TOWNSHIP
SEASIDE PARK BORO
SEASIDE HEIGHTS BORO
LAVALLETTE BORO
DOVER TOWNSHIP
BRICK TOWNSHIP
MANTOLOKING BORO
BAY HEAD BORO
POINT PLEASANT BEACH BORO
BAY
LEGEND
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
DISTRICT BOUNDARY
SERVICE AREA BOUNDARY
SUB-SERVICE AREA BOUNDARY
EXISTING TREATMENT PLANT
(SEE APPENDIX)
EXISTING
PHASE I
FUTURE
GRAVITY LINE INTERCEPTOR
FORCE MAIN INTERCEPTOR
OUTFALL LINE
PUMPING
METERING STATIONS
WATER POLLUTION ABATEMENT FACILITIES
LANDFILL SITES
EXISTING POPULATED AREAS
EXISTING SEWERED AREAS
PUBLIC WATER SUPPLY - EXISTING WELLS

SOUTHERN SERVICE AREA
GREAT BAY
LITTLE EGG HARBOR TOWNSHIP
TUCKERTON BORO
EAGLESWOOD TOWNSHIP
STAFFORD TOWNSHIP
MANAHAWKIN BAY
BARNEGAT BAY
LONG BEACH TOWNSHIP
BEACH HAVEN BORO
ATLANTIC OCEAN
SHIP BOTTOM BORO
SURF CITY BORO
HARVEY CEDARS BORO
BARNEGAT LIGHT BORO
LONG BEACH TWP 30TH STREET LIFT STATION
LONG BEACH TWP MASSACHUSETTS AVENUE LIFT STATION
SHIP BOTTOM SURF CITY PUMP STATION
NORTH ISLAND INTERCEPTOR
HARVEY CEDARS PUMP STATION
LONG BEACH SO. LOVELADIES PUMP STATION
LONG BEACH NO. LOVELADIES PUMP STATION
MANAHAWKIN BAY CROSSING INTERCEPTOR
SOUTHERN OUTFALL
MANAHAWKIN INTERCEPTOR
SCALE IN MILES
LEGEND
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
ZONE
AREA
R-1
1 ACRE
R-2
15,000
R-3
R-4
7,500
R-5
C-1
C-2
C-3
7,500
M-1
2 ACRES
L-C
15,000
WETLANDS
STATE FOREST, PARKS & MILITARY

Fulton County, Georgia

1. Introduction

1.1 Project Description

This case study examines several interceptor projects designed to expand the small existing sewerage system in the northern portion of Fulton County, Georgia. The service area for the proposed interceptors lies directly north of the City of Atlanta, and the area is connected to the city by a network of high-speed highways. It is a largely unincorporated area (only two small incorporated areas currently exist, though they are rapidly annexing additional land) which is quickly developing into upper income residential neighborhoods. The area is considered the most desirable residential location in the County, and there are no plans for industrial development.

The interceptors included in this study (see Figure 1) are components of a plan to sewer the entire county north of Atlanta within the next few years, a plan developed in recognition of the very rapid growth of the entire Atlanta metropolitan area. Each of the five interceptors studied serve subbasins of the Chattahoochie River, the major water supply source for the communities north of Atlanta. In part, these interceptor projects have been given priority because they will ensure the protection of this water supply source.

Three of the five interceptors will serve areas south of the Chattahoochie River, in the planning area known as Sandy Springs. The Sullivan's Creek and Pitts Road interceptors are located in the River Ridge sub-basin, in the eastern portion of this planning area. Together, they will serve a 3,300 acre tract of land which is still largely undeveloped, but developing residentially at a rapid rate. The Ball Mill Creek interceptor will serve the 3,766 acre tract which comprises the Ball Mill Creek sub-basin, located in the western portion of the Sandy Springs planning area and spilling over into DeKalb County. This area is also largely undeveloped at present, but also developing very rapidly.

The two remaining interceptors, the upper Big Creek interceptor and the Foe Killer Creek interceptor will be located north of the Chattahoochie River, serving the upper Big Creek and Foe Killer Creek sub-basins. The service area of these interceptors includes an incorporated area (Alphrata) presently without sewer facilities, and a total of over 30,000 acres of land surrounding this small city. Land in this service area has developed on either side of the North Fulton Expressway, but the major portion of the area is as yet undeveloped. It, too, is developing rapidly, however.

These five interceptors will not, by themselves or with existing lines, immediately form one comprehensive sewage system. The Sullivan's Creek and Pitts Road interceptors will connect to an interceptor now under construction in Cobb County, for treatment at a Cobb County Sewage Treatment Plant. The Ball Mill Creek, upper Big Creek, and Foe Killer interceptors will connect to an existing Big Creek interceptor (which will be paralleled by a Big Creek Relief Sewer, not included in this case study because it is a replacement line which will not directly open new area for development). The existing and proposed lower Big Creek interceptors will carry the wastewater flow for treatment in a Fulton County facility, the Big Creek Sewage Treatment Plant.

Unlike other local interceptor projects included in our case study sample, these Fulton County interceptors were initially funded under PL660, then delayed pending an EIS. At present, the 660 funds awarded have been released (and increased somewhat) and will be used to fund several of the interceptors, with the county funding those which cannot be covered by the limited federal money. Though these are "earlier" projects than others we have studied and are ones which will not be receiving 92-500 funds, the history of these projects--and the land use controversy that has surrounded them--makes them both interesting and appropriate for study.

1.2 Project History

Prior to 1969, there were no immediate plans to provide a comprehensive sewerage system for the study area--a Regional Water and Sewer Plan published in 1968 did not include sewer plans for the North Fulton County area, presumably because of the very low population densities in this area at that time. However, in late 1969 and 1970, the situation had changed dramatically: the development of a highway network to serve the area stimulated residential construction, and both the state and the county agreed that continued development of the area should not be permitted unless a sewer system was expeditiously planned and constructed. The study area simply could not support septic tanks; the few populated sections of the area were already encountering pollution problems; and the very difficult problems that had been experienced by a neighboring county in permitting the construction of small sewage treatment facilities with each new residential development indicated that this was not a viable solution to the waste disposal problems of a developing area, even on a short term basis. Because rapid development of this area into upper income residential neighborhoods was considered both desirable and inevitable, the County was fully prepared to proceed in the planning of a comprehensive regional sewage collection and treatment system.

As a result, the County Department of Public Works secured a HUD grant for an initial sewer study, and engaged consulting engineers familiar with the area to plan this system, phasing the plan to accomodate relatively rapid residential growth. Though the engineers utilized available population and land use data from local planning agencies, the available data was not comprehensive, and much of their work was based on population and land use projections they developed internally. All major interceptor lines were sized for the ultimate population of the area to be served, an accepted engineering procedure in the County.

Though the two major planning agencies concerned with this service area--the Fulton County Planning Department and the Atlanta Regional Commission (the local A-95 agency)--did not actively participate in this early planning process, they did approve the engineering firm's plans, after some downward revisions of the population projections. Both the county and the state agencies supervising sewer development also approved these plans, and a series of grant requests were made to EPA to finance the expansion of the Big Creek Sewage Treatment Plant, and the construction of the first phase of interceptor lines (to serve the areas now served by the interceptor projects described in this report). An environmental assessment was also prepared to be included in the request for the funds, and EPA awarded a series of PL660 grants during 1971 and 1972. Outward appearances indicated that there was great support for the program at that time, and little, if any, opposition. It was anticipated that the projects would proceed smoothly, with additional EPA funds made available as new components of the plan were phased in by the County.

However, as the design and construction phase of the project began, opposition did materialize. Several very active community environmental groups and the Federal Bureau of Outdoor Recreation (BOR)--who had been unaware of the progress in these particular sewage treatment plans--voiced strong opposition to the placement of interceptor lines within the Chattahoochie River Corridor. Since both the citizens' groups and BOR had been working for several years to acquire land in the Corridor for recreational purposes, and to protect areas within the Corridor from overdevelopment, they were extremely concerned over the proposed placement of interceptor lines along the river, and the necessary destruction of the natural rock formations which this plan entailed. They also voiced opposition to the magnitude of the sewer project and questioned both the need for the large-sized sewers and the quality of planning performed. They requested that an Environmental Impact Statement on the entire project be prepared by the EPA.

The regional EPA responded by withholding funds for all North Fulton County projects, with the exception of one interceptor already in construction and the proposed expansion of the Big Creek Sewage Treatment Plant, pending the preparation of an Environmental Impact Statement. Though they had originally accepted the negative environmental assessments submitted by the county with each grant application approved, EPA staff recognized the legitimate concerns of the environmental groups and believed that the steadily increasing magnitude of the overall sewer system, then being funded on a piecemeal basis, deserved an impact statement.

Over the following 18 months, as the Environmental Impact Statement was prepared, certain very controversial interceptors were re-designed to avoid the most negative consequences of the then existing plans: the destruction of natural rock formations and the placement of large sewers in areas already designated as recreational sites. At this time, the proposed River Ridge interceptor was abandoned and replaced by the Sullivan's Creek and Pitts Road interceptors: this change preventing destruction of rock formations along the east bank of the Chattahoochie River by pumping sewage across the river into a Cobb County interceptor for transport down the west side of the river. Plans for the Ball Mill Creek interceptor route were also changed, with the line also being moved across the river to avoid destruction of a sensitive recreational area.

However, these were the only changes made. Though the environmental groups and some staff within EPA questioned the magnitude of the proposed project and its impact on land use and development in the area, neither the large service areas or the large sizing of the interceptor lines were changed. As re-routed, the "projects as proposed" were accepted in the draft EIS, and a public hearing was held. At this hearing, both strong support and strong opposition were voiced. The final EIS approved release of funds already granted by EPA, and indicated that further components of the over-all plan might be funded without further environmental assessment. Because of the delay in the design and construction of the projects, there are insufficient funds available to cover the 33% federal share promised in 1971. The regional office is now working with the county to secure additional federal funding for these projects, and the county has agreed to finance several of the interceptors without federal participation. At this time, the Ball Mill Creek Interceptor is under construction using the 1971 federal funds, and the Big Creek, Foe Killer and Pitts Road interceptors are under construction without federal monies involved. Both the Sullivan's Creek interceptor and the Big Creek Relief Sewer are still in the design phase, and it is expected that the former will receive very reduced federal support using the 1971 funds while the latter may be eligible for 75% federal funding. However, a staff member at the EPA office stated that further federal funding for North Fulton County projects is not a high priority expenditure, and he would be surprised if EPA awarded 92-500 funds for this purpose in the forseeable future.

1.3 Project Purpose

Those supporting the North Fulton County sewer plans clearly view the proposed system both as a means to correct existing sewage problems created by rapid, recent residential development and to permit further residential growth without endangering the quality of their major water supply source, the Chattahoochie River. They view the rapid development of this area into a high income residential location as an inevitable phenomena; undesirable only to the extent that it will cause water quality problems. Though they initially resisted attempts by environmentalists to protect the scenic areas immediately adjacent to the river, they have bowed to this pressure and are not unmindful of the value of planning for undeveloped scenic and recreational areas along the river corridor. In general, they view their responsibility for sewer development as providing a necessary service in their urbanizing county, and they wish to be fully prepared for the development that will take place.

Those opposing the sewer plans were initially concerned only with the effect of the project on the river corridor, and it appears that rerouting of the sewers to avoid the most valued land satisfied their earliest objections to the project. Only later did they begin to view the project as a major threat to land use planning efforts for the entire service area, and as a definite incentive for developers to quicken the pace of development and plan the construction of high-density residential units without the constraints of land use controls.

The land use planning agencies in the community do not appear to have strongly supported either side of this controversy. Though it appears that they recognize the possible negative effects of too-rapid development and would desire more control over the development process, they have not used the sewer planning process as a vehicle for expressing this concern.

2. Land Use Planning

2.1 Land Use and Population Trends in the Study Area

Until very recently, the study area was a very low density residential area, consisting primarily of forest and agricultural land. However, with the rapid increase in growth of the Atlanta metropolitan area and the development of a major highway network through the study area, this section of the county became a prime residential development area, and the population began to increase dramatically. The most recent population figures show a growth of 12.2% in the North Fulton County area in only one year- from 1973-1974. It is felt that the great availability of land, the trend of population growth out of Atlanta and to the north, and the presence of the North Fulton Expressway will result in a continuing high rate of population growth in the forseeable future.

It is not anticipated that any portion of the study area will develop into major commercial or industrial areas, for the location and the natural features of the area make it an ideal residential area. Developers do expect, however, to move from almost totally single family development to high density housing, including planned unit developments. This trend has already begun, with apartment complexes now constructed or being built in the areas immediately adjacent to the river and the major highways.

2.2 Land Use Planning Agencies and Controls

At present, the Fulton County government exerts little control over residential development in the unincorporated areas of the county. In general, the elected officials and the established county agencies view development in these areas as desirable, and they are particularly satisfied with the type of development occurring in the northern sections of the County. As a result of this attitude, land use planning is viewed as a process of anticipating the development which will take place, and then providing the necessary services which will enable this development to occur without major problems.

The Public Works Department, one of the most influential county agencies, has permitted developers to install septic tanks and package plants where no sewer service was available. However, as mentioned previously, they do not wish to permit any more waste disposal systems of this kind in the northern segments of the county, and they are prepared to sewer the area as necessary to keep up with the pace of development. Developers have also expressed a willingness to provide funds for this service, and there appears to be a general consensus among county personnel that development should not be, and will not be, inhibited by the lack of an adequate sewage system.

The Fulton County Planning Commission, and its staff in the Planning Department, are technically responsible for overseeing the development process in the county, but the Department is a relatively new agency which has yet to exert significant influence on development. Shortly after the formation of the staff unit in 1965, staff worked to create Development Plans for each section of the county--plans which would generally forecast the anticipated ultimate land use in each area and which could be used as a guide in making zoning decisions. They do not, however, view these Development Plans as instruments for the control of the timing or type of development to be permitted; they are only a general guide for their planning activities.

Zoning decisions are coordinated by the Planning Department, which submits each zoning application to the Public Works, School and Health Departments for review. The Planning staff then makes a recommendation, which is generally, though not always, accepted by the appointed Planning Commission. Consistent with their generally favorable attitude toward residential development, the Planning Commission favors zoning from agricultural use to residential, or from lower to higher density residential use, and these requests are routinely approved. In the North Fulton area, the high-income nature of the development mitigates against any zoning difficulties since both the developers and the county are willing to make financial commitments to provide services.

The Atlanta Regional Commission (ARC) - the A-95 Agency formed in 1971--is a potentially influential land use planning body. To date, they have restricted their activity to collecting land use and population data on the metropolitan area, but they are now in the process of developing a population forecasting system based on alternative transportation and land use control strategies and they are just beginning to consider the energy consequences of future development. They do not, however, view their role, either now or in the future, as one of direct control; they are working to establish relationships with city and county planning agencies that will enable them to influence these existing bodies in their planning processes. Though it is too early to judge the impact of ARC's work, the staff of the Fulton County Planning Department is attempting to make their forecasts for land use and population consistent with those being developed by the ARC, one measure of their influence in the planning community.

In terms of approving large scale sewer projects, such as the one to serve North Fulton County, the planning agencies have yet to consider the possible negative impacts of these projects both in terms of permitting very rapid development and permitting types of high density development that do not conform to the general development plans they have made for the North Fulton area. To a certain extent, their lack of attention to these projects may reflect their relative lack of established power positions in county government and their lack of influence over the development process. However, it is also true that they do not view the North Fulton County residential development with alarm: they, too, think it is as inevitable and desirable, and appear willing to permit this development without strong land use controls.

2.3 The Land Use and Population Projections Utilized in the Sewer Project Design

At the time when the Public Works Department determined that a comprehensive sewerage system was needed for the northern sections of Fulton County, the Planning Department had little reliable projected population and land use data available, and the consulting engineers were given the task of developing the projections. To develop these projections, the engineers collected a variety of population estimates and studies from the local planning agencies, from developers and from consultants to other government agencies, and used their own considerable experience in performing engineering work for the County.

The basic methodology employed by the consulting engineers was to consolidate the various estimates on projected population and land use within segments of the service area, and examine these in light of recent trends in population growth and stimulants for growth (primarily vacant developable land and the transportation network as existing and planned). They then formulated a land use map, assigning specific densities to each area and estimating the timing of development in each area. Their final population figures correspond to two land use/density maps which they developed, one for 1990, and one for the ultimate population (considered to be reached by 2020-2030). The interceptors were then sized for ultimate population, using a 100gpcd standard and a 2.5 peak to average flow ratio.

When the consulting engineer's sewer study was submitted for review, the Planning Department of Fulton County took exception to the high population figures estimated for 1990 and ultimate population, for the engineer's land use/density projections were considerably higher than any estimates that had been previously made by the Planning Department. As a result of this objection, a compromise was reached, and the Engineers lowered the projected populations somewhat and sized the interceptors slightly smaller. The population projections as revised were submitted in the federal grant applications and remain the basis for the sizing of the proposed interceptors. For each interceptor, the population projection figures are:

Interceptor	Service Area Population		
	1970	1990	Ultimate
Big Creek	6,798	70,857	160,946
Foe Killer	3,101	13,012	34,271
Ball Mill Creek	1,550	20,880	40,922
Sullivan's Creek Pitts Road (Formerly River Ridge)	(no current data)	20,000	25,000

Disagreement between the Planning Department and the consulting engineers still exists, however, even though a compromise was reached. The Planning Department does not believe that ultimate population estimates are at all reliable, including the estimates used to size the interceptors, and refuses to commit themselves to population projections beyond the year 1990. The consulting engineers, on the other hand, feel that ultimate population projections are essential since they believe the interceptors must be sized for this population level. As will be discussed in the following section, this issue was reviewed by EPA and the consulting engineers' position accepted. In addition, there is no real agreement on the population figures even for the year 1990. The planning staff anticipate relatively little high density multi-family development, and a great deal of very low density single family development (1 unit/acre) in the area. The consulting engineers, on the other hand, believe that the entire River Ridge and Ball Mill Creek area will develop in moderate densities, and high density areas will develop just south of the Chattahoochie River and at scattered sites along the North Fulton Expressway (in the Big Creek Sub-basin). Again, the EPA viewed the engineer's estimates as more reliable, based on their own study, though the Planning Department as well as ARC are now predicting an even lower population growth than they had estimated at the time the compromise figures were agreed upon.

3. The Land Use Impact Evaluation Process

3.1 Governmental Review

Once the County Public Works and Planning Department had agreed on the sewer projects, grant requests were prepared for each major component in the first phase--including the River Ridge (now Sullivan's Creek and Pitts Road) and Ball Mill Creek interceptors, as well as expansion of the Big Creek Sewage Treatment Plant. (The Big Creek and Foe Killer interceptors were Phase II projects not submitted for funding.) These requests were submitted piecemeal to the A-95 agency for approval, and were immediately approved--apparently without detailed review. They were also approved by the state water quality agency, which at that time had funds available for projects which could begin immediately. The EPA made grant awards, based largely on the state and local recommendations.

However, when the private environmental groups (including the Georgia Conservancy and the Friends of the River) and the Bureau of Outdoor Recreation opposed specific design plans for several of the proposed interceptors, the Regional Office determined that an Environmental Impact Statement should be prepared to ensure that these and other specific projects planned for later phases were consistent with EPA standards. At this time, EPA encouraged accommodation by the county to specific rerouting requests made by the opposing groups, and by a process of negotiation, changes in the routes were made to avoid destruction of recreational and scenic areas along the river. Meanwhile, the Environmental Impact Statement (EIS) staff evaluated the projects as revised, witholding funds pending the completion of their work.

In mid-1973 the draft EIS was submitted for comments, and a public hearing was held. The EIS commended the accommodations that had been made by the County in rerouting the sewers to avoid damage to the River Corridor, and approved the release of funds for the projects based upon the inevitability of rapid development in the area, and the need to have a waste disposal system which would prevent pollution of the major water supply source.

Though the Environmental Impact Statement did study the problem of urban run-off in detail, concluding that the run-off would cause significant pollution problems by 1990 with or without federal approval of the projects, it merely mentioned the other adverse secondary impacts of development. The following quotation from the final EIS represents the consideration given to the land use implications of the projects and also explains why the EIS approved the projects as proposed:

> Secondary Effects: The effect of the proposed projects would be the supporting of development which is being motivated by the abundance of raw land, environmental attractiveness, existing roads and expressways, available water supply, and the desire of people to live in the north Fulton County area. This effect can be adverse to the physical and social environment if sufficient land use controls and public services are not provided as mitigating measures. Areas of secondary effects are soil erosion

> sedimentation/siltation; urban runoff; reduction of open spaces and aesthetically pleasing areas; and increases in solid waste, traffic congestion, air quality deterioration, noise, and social ills (tension, divorces, crimes, etc.)
>
> EPA does not have the authority to limit land development, dictate the type of land developments, or require ordinances relating to soil erosion/sedimentation/siltation. The mitigating measures of land use control and public services must be provided by the local governments.
>
> EPA realizes that sewers can support development and that some adverse effects can occur. Calculation of the amount of adverse effect is most difficult to make because of the existing strong motivating factors for development and the varying amount of land use controls and public services that the local governments would provide. (Emphasis added.)

At the public hearing that was held after the submission of the draft report, the established government agencies strongly supported the Statement, for it would permit initial sewering of areas experiencing pollution problems and would prevent future problems caused by the continuing development in the area. The Fulton County Planning Department supported the plans, stating that the comprehensive sewering of the area would aid in the development of low density residential areas, since the existing limited sewerage system was creating pressure to build high density units in currently sewered areas. They made no mention of the possible adverse secondary impacts. Though the ARC initially expressed concern over the secondary impacts and recommended that the interceptors be sized for a 1995 population rather than for the ultimate population densities, their objections were apparently ignored. (The staff at this agency were not critical of this action when interviewed; they appeared to accept the EIS position that development and sewering of this area will occur with or without federal involvement.) After the hearing, the final EIS was prepared without change in the land use implication position taken in the draft statement, and funds are now being released for design and construction.

3.2 Non-Governmental Involvement: Special Interests and Public Attitudes

3.2.1 Developers

As one would expect, the developers in the Fulton County area have always strongly supported plans for expansion of the sewer system in North Fulton County. As in many still urbanizing areas of the country, the developers and the county government have a close cooperative relationship, and these North Fulton projects were planned in response to the needs of the developers, as well as in response to existing pollution problems. Many developers now own tracts of land which cannot be developed, particularly as multi-family units, unless sewers are provided, and thus there is an urgency in their requests for sewer system expansion.

Though the developers will clearly benefit from the EPA funding now committed in the North Fulton County area, lack of support by EPA will probably not prevent the county from sewering large sections of this area without federal funding. Land prices in the area are high and rising, and developers are willing to participate in the costs of constructing interceptors and sewage treatment facilities. At present, developers have commited themselves to pay the 75% federal share on another large sewage treatment project in the eastern portion of North Fulton County (John's Creek), which was not awarded a federal grant.

3.2.2 Public Attitudes and Involvement in the Project

Though it is always difficult to characterize public attitudes, there appear to be two primary groups involved in the North Fulton County sewer controversy. The elected officials in the two incorporated areas, who represent individuals living in the most densely populated areas, have always supported the plan, for the proposed projects will mean a solution to existing septic tank pollution problems. The city of Roswell, now partially sewered, will be able to construct collection systems for the unsewered areas once the Big Creek interceptor is built, and the city of Alphrata will be able to build their first sewer system to connect into this same interceptor. Sewering of these two areas is a primary objective of the overall sewerage program, and there is a recognized need for meeting this objective as quickly as possible. At the public hearing and in written comments, the mayors of these cities expressed their approval and requested rapid completion of the proposed projects.

The residents of the unincorporated areas, however, have spoken only through environmental groups which have opposed the project; there has been no organized effort to support the plans.

Public opposition began when several residents of the proposed service area became aware of plans to place large sewers in their immediate neighborhoods, adjacent to the southern and eastern banks of the Chattachoochie River. These residents mobilised the established environmental groups which had opposed similar plans in another Chattahoochie drainage basin, as well as the public agencies planning for recreational development along the Chattahoochie River corridor. The pressure these groups were able to bring on the EPA regional office was the major factor in the decision to halt planning on the projects and prepare an environmental impact statement.

Initially, the only publically expressed concern was the project's immediate impact on land lying within the narrow river corridor. This concern was forcefully expressed and changes were made in the interceptor plans in response to the public opposition. It was not until the public hearing on the draft environmental impact statement that issues involving adverse secondary impacts were raised, and opposition based on this concern did not produce any changes in the plans.

At the present time, the environmental groups have filed a court action to force EPA to reconsider the stance they have taken with respect to the land use implications of the EPA projects. The attorney for one of these groups, Friends of the River, believes that the National Environmental Protection Act requirement for a land use plan was violated in the review of this project, since Fulton County has no enforcible land use plan for the area.

At present, no action has been taken on this case by the court. Though EPA is aware of the suit, they are proceeding with the interceptor project funding because they do not believe they have any land use planning responsibility or authority.

4. The Influence of the Impact Evaluation

Despite the fact that the Environmental Impact Statement expressed concern over adverse secondary impacts of development and residents of the service area have voiced opposition to the project based on its land use planning implications, the projects as initially proposed have undergone only minor modification during the planning process and no in-depth study of the relationship between the project and future land use consequences has been performed.

This is not to say, however, that the impact evaluation process for the North Fulton County projects reflects a lack of responsible review. From the point of view taken in the impact statement, the land use implications are important, but they are simply not issues which can be controlled by the EPA. Furthermore, there are certainly compelling reasons for approval of the projects--existing pollution in several areas, the need to protect the water supply, and the inevitability of further development in this area. The fact that developers and the county appear prepared to finance interceptors without federal support also places the EPA staff in a difficult position. If they do not participate in the projects, they will lose influence and control over the design and construction of the sewer system in the area, and in the long run this may have more serious consequences than approving projects which are less than perfect.

However, those opposing the planned projects are also correct in their view that the EPA might have taken a stronger stance on the land use planning aspects of the plans approved, and perhaps negotiated for the imposition of some land use controls in exchange for the release of funds. They may also be correct in their feeling that the developers and the county are not all that prepared to finance the larger projects planned for later development (and covered by the EIS), although this is a questionable prediction, since the County has already assumed some responsibilities in this direction.

5. Other Project Attributes Influencing Land Use

5.1 Project Staging

One issue which has not yet been discussed, and which has raised some controversy, is the staging of the construction of the interceptors within the Chattachoochie River

Basin. As planned, the entire area will be sewered quite rapidly and many of the major interceptors will connect to the Big Creek Relief Sewer which will transport the sewage along the north side of the River to the Big Creek Sewage Treatment Plant located in the extreme southwestern corner of the drainage Basin. Though the existing sewer line in this area will be adequate for several years, it is clear that a relief sewer will be necessary at least by 1980. The question concerns the priority to be given to this project and the size of the sewer that should be developed.

The Environmental Impact Statement addressed both of these issues. First, it stated that the Big Creek interceptor upstream from the existing sewer, and the Foe Killer interceptor, both planned for construction after the Relief Sewer, must be given higher priority. Since federal funding was limited, funds would be used for the relief sewer only under the condition that the County simultaneously construct the Big Creek/Foe Killer interceptors without federal funds, which they have agreed to do. On the issue of size, the EPA initially determined that this sewer (unlike the others) should be sized only for a 1990 population, with replacement at that time. However, a reconsideration of this issue resulted in the approval of a sewer sized for ultimate population. Both of these decisions have been opposed on the theory that they will permit very high density development of the area immediately adjacent to this sewer, without encouraging lower density development throughout the area. There is a fear that such high density development will rapidly result in this sewer reaching capacity prior to the ultimate development of the area, and that developers will then exert pressure to further expand sewer system capacity in North Fulton County, thus permitting more high density development. Given the absence of land use controls imposed by the County, this result is perfectly possible, yet this was not an issue addressed in the Environmental Impact Statement. It may well be an issue that will be raised in the legal proceedings now contemplated by the Friends of the River, for it certainly deserved some minimal attention.

5.2 Project Financing

From the available information, it appears that the non-federal share of the cost of these interceptors (which could exceed 70% of the combined cost of the five projects) will be paid by Fulton County, from revenue recently raised by a sewer bond issue. (Though developers are paying the 75% federal share for several interceptors and a sewage treatment plant in the Johns Creek area of North Fulton County, they are not, apparently, supporting these particular interceptor projects.)

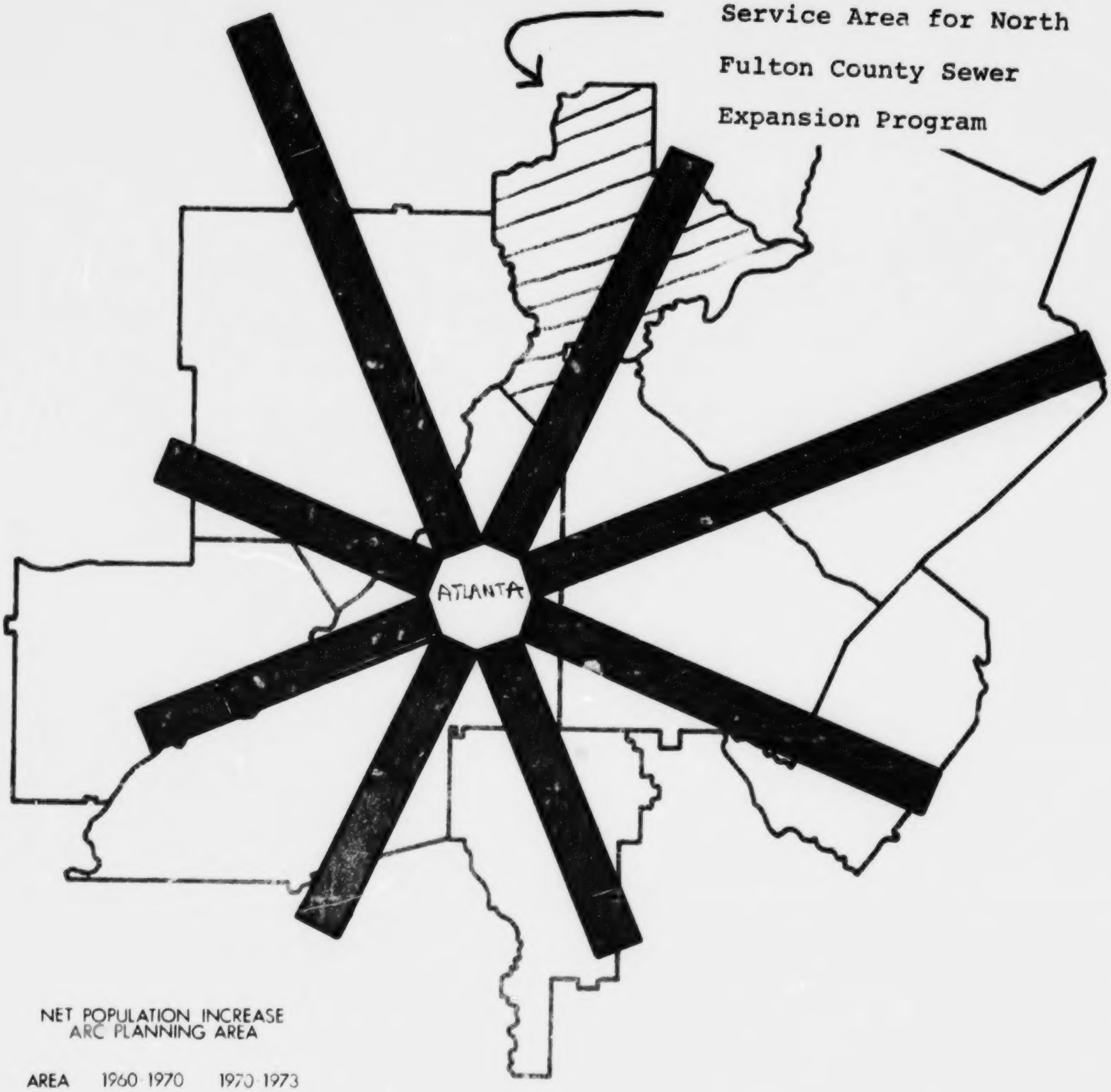
To repay these bonds and to operate the sewage treatment system, revenue from connection charges and monthly user charges will be used. It appears that the existing residents of the area will be paying a disproportionally high share of the costs of the system, for the connection charges were recently lowered and the user charges increased. This change would be consistent with the encouragement to development generally given by the county, but it was impossible to determine just what motivated the change in the rate structure.

5.3 Regionalization

Undoubtedly, the regionalization of sewage treatment at several major plants will require interceptors to be constructed through large tracts of land which are vacant and developable. However, there is a great need to protect the rivers in the area from pollution, and thus the only alternative would be to create small but highly efficient sewage treatment plants in the small scattered high density areas. This alternative was considered, but rejected both by the local planners and the EPA. From the local point of view, the opening up of the land by interceptor construction is not viewed as undesirable, and thus there was never objection to greater regionalization. Costs also influenced the EPA decision, though the fear that the smaller plants might rapidly reach capacity and begin creating river pollution problems was a key factor in the decision to regionalize the sewage treatment.

APPENDIX

FULTON COUNTY INTERCEPTOR PROJECTS



Service Area for North Fulton County Sewer Expansion Program

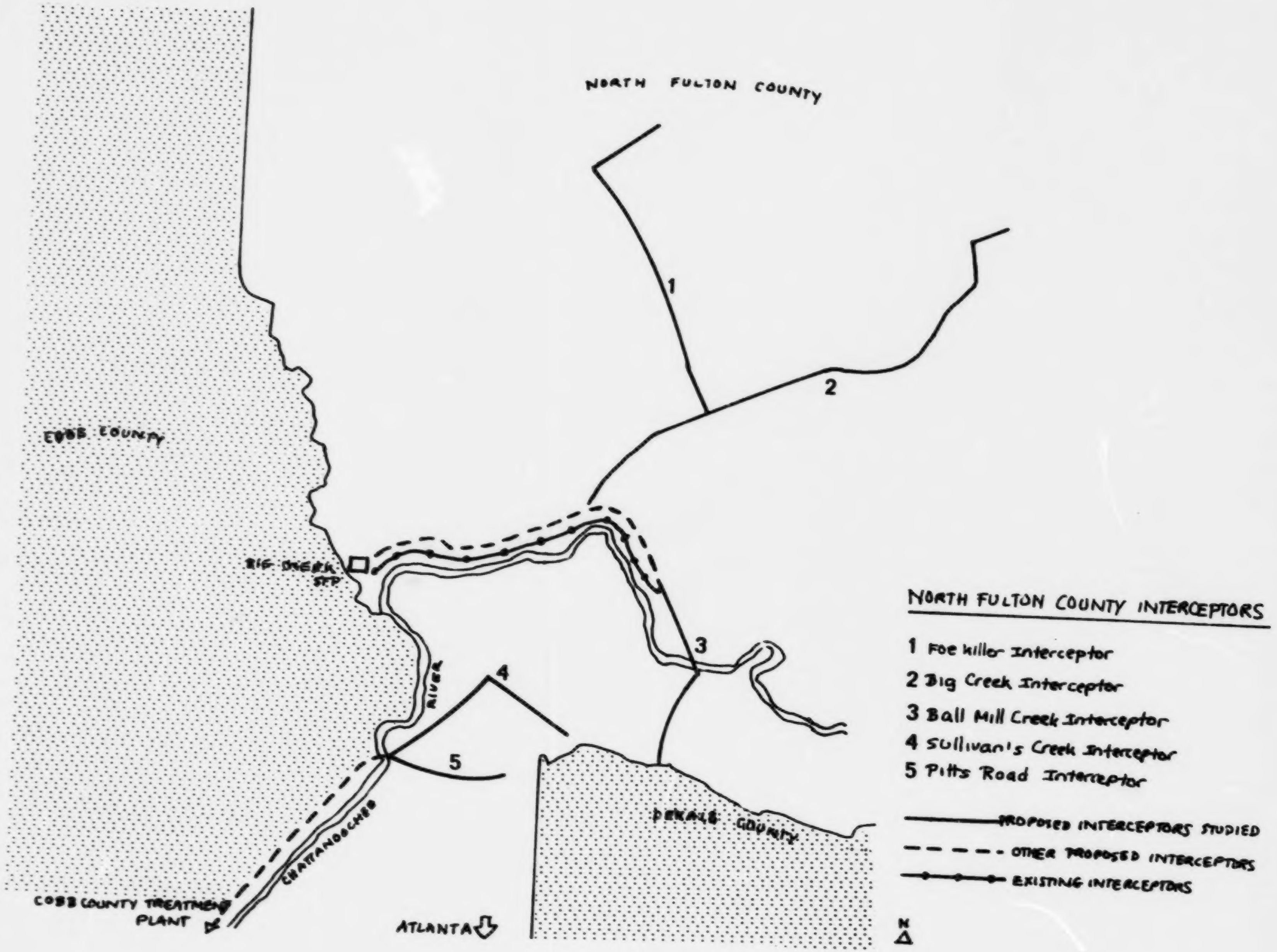
NET POPULATION INCREASE
ARC PLANNING AREA

AREA	1960-1970	1970-1973
ENE	80,697	33,984
ESE	57,847	25,925
SSE	51,290	10,814
SSW	27,169	33,243
WSW	40,881	18,448
WNW	49,185	6,480
NNW	80,813	27,119
NNE	66,831	14,850

CENTRAL AREA, REPRESENTED BY OCTAGON, HAD A NET LOSS OF 83,000 PERSONS SINCE 1960.

■	1960-1970
▨	1970-1973

LOCATION MAP FOR NORTH FULTON COUNTY


NORTH FULTON COUNTY
COBB COUNTY
BIG CREEK STP
RIVER
CHATTAHOOCHEE
COBB COUNTY TREATMENT PLANT
ATLANTA
DEKALB COUNTY
1
2
3
4
5
NORTH FULTON COUNTY INTERCEPTORS
1 Foe killer Interceptor
2 Big Creek Interceptor
3 Ball Mill Creek Interceptor
4 Sullivan's Creek Interceptor
5 Pitts Road Interceptor
PROPOSED INTERCEPTORS STUDIED
OTHER PROPOSED INTERCEPTORS
EXISTING INTERCEPTORS
N

Statistical Data on the Fulton County Interceptors

	Sullivan's Creek/ Pitts Road Interceptors	Ball Mill Creek Interceptor	Big Creek/Foe Killer Creek Interceptors
Length:	*	1.4 miles	13.3 miles (Big Creek) 4.5 miles (Foe Killer
Type:	gravity	gravity	gravity
Service Area:	3,300 acres	3,766 acres	22,000 acres (Big Creek) 8,500 acres (Foe Killer
Initial Population:	*	1550	6,789 (Big Creek 3,101 Foe Killer
Design (1990) Population	20,000	20,880	70,857 (Big Creek 22,089 (Foe Kille
Ultimate Population	25,000	40,922	160,946 (Big Creek 34,271 (Foe Kille

(Flow rates for the interceptors are based on 100 gpcd, since no significant commercial or industrial flow is anticipated.)

* This data was not available on these interceptors.

Financial Data on the Fulton County Interceptors

The following are the most recent total cost figures for the interceptor projects:

Sullivan's Creek interceptor:	$ 553,000.
Pitts Road Interceptor:	$ 635,000.
Ball Mill Creek Interceptor:	$1,576.000.
Big Creek/Foe Killer Interceptors:	$3,572,000.

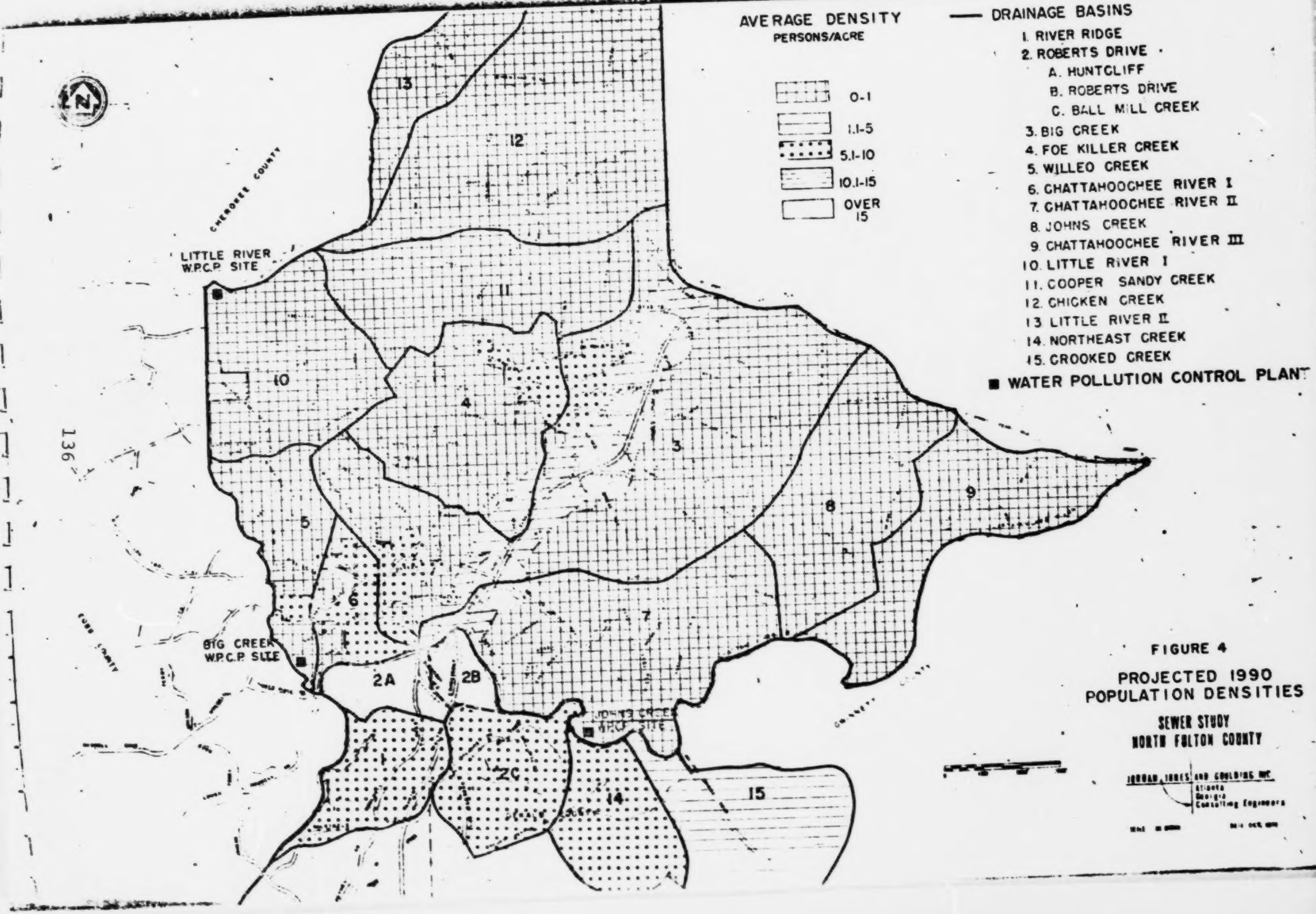
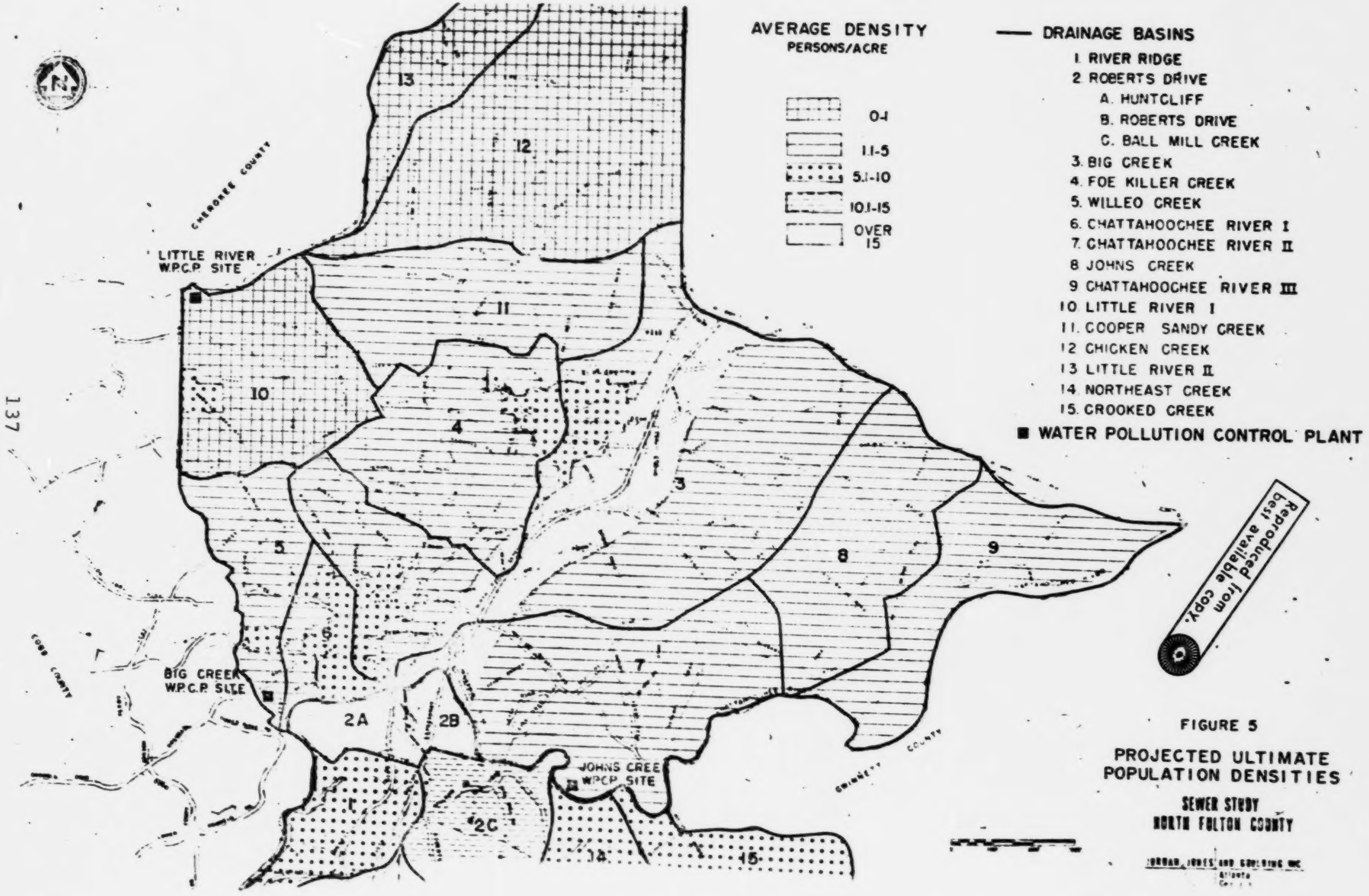

AVERAGE DENSITY
PERSONS/ACRE
0-1
1.1-5
5.1-10
10.1-15
OVER 15
DRAINAGE BASINS
1. RIVER RIDGE
2. ROBERTS DRIVE
A. HUNTCLIFF
B. ROBERTS DRIVE
C. BALL MILL CREEK
3. BIG CREEK
4. FOE KILLER CREEK
5. WILLEO CREEK
6. CHATTAHOOCHEE RIVER I
7. CHATTAHOOCHEE RIVER II
8. JOHNS CREEK
9. CHATTAHOOCHEE RIVER III
10. LITTLE RIVER I
11. COOPER SANDY CREEK
12. CHICKEN CREEK
13 LITTLE RIVER II
14. NORTHEAST CREEK
15. CROOKED CREEK
WATER POLLUTION CONTROL PLANT
N
CHEROKEE COUNTY
COBB COUNTY
GWINNETT COUNTY
LITTLE RIVER W.P.C.P. SITE
BIG CREEK W.P.C.P. SITE
JOHNS CREEK W.P.C.P. SITE
13
12
11
10
4
3
5
6
7
8
9
2A
2B
2C
14
15

FIGURE 4

PROJECTED 1990
POPULATION DENSITIES

SEWER STUDY
NORTH FULTON COUNTY

JORDAN, JONES AND GOULDING, INC.
Atlanta
Georgia
Consulting Engineers


AVERAGE DENSITY
PERSONS/ACRE
0-1
1.1-5
5.1-10
10.1-15
OVER 15
— DRAINAGE BASINS
1. RIVER RIDGE
2 ROBERTS DRIVE
A. HUNTCLIFF
B. ROBERTS DRIVE
C. BALL MILL CREEK
3. BIG CREEK
4. FOE KILLER CREEK
5. WILLEO CREEK
6. CHATTAHOOCHEE RIVER I
7. CHATTAHOOCHEE RIVER II
8 JOHNS CREEK
9 CHATTAHOOCHEE RIVER III
10 LITTLE RIVER I
11. COOPER SANDY CREEK
12 CHICKEN CREEK
13 LITTLE RIVER II
14 NORTHEAST CREEK
15. CROOKED CREEK
■ WATER POLLUTION CONTROL PLANT
N
CHEROKEE COUNTY
LITTLE RIVER W.P.C.P. SITE
COBB COUNTY
BIG CREEK W.P.C.P. SITE
JOHNS CREE W.P.C.P. SITE
GWINNETT COUNTY
1
2A
2B
2C
3
4
5
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7
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12
13
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15

Reproduced from best available copy.

FIGURE 5

PROJECTED ULTIMATE POPULATION DENSITIES

SEWER STUDY
NORTH FULTON COUNTY

JORDAN, JONES AND GOULDING INC
Atlanta
Georgia

Horn Lake Creek, Mississippi and Tennessee

1. Introduction

1.1 Project Description

The Horn Lake Creek Interceptor is a joint Mississippi/ Tennessee sewage transport project designed to serve the rapidly growing Horn Lake Creek Drainage Basin. The project will serve a 62.5 square mile area encompassing the northeastern portion of DeSoto County, Mississippi and smaller portions of southern Shelby County, Tennessee. The service area includes land within the city limits of Memphis, Tennessee, but nearly 80% of the area lies in Mississippi.

As the Memphis Metropolitan area has experienced rapid population increases over the past 10 years, there has been exceptionally rapid residential development in the Horn Lake Creek basin. Planning agencies in both states predict that the population of the EPA project's service area will increase dramatically over the next 30 years, from a current population of 34,000 to 208,000 by the year 2000. Though most of the area is expected to develop for residential uses, several industrial parks are now being constructed and the percentage of land devoted to commercial use is expected to increase.

The joint state project consists of one large interceptor originating in two branches in the eastern portion of the drainage basin, and moving northwest through DeSoto and Shelby counties to the South Memphis Sewage Treatment Plant. Along the main interceptor, smaller interceptors will be constructed to serve the sub-basins of the Horn Lake Creek. (See Figure 1 for the route of the interceptor in Mississippi, Figure 2 for its route in Tennessee.) To manage the construction and operation of the interceptor, Mississippi created the Horn Lake Creek Interceptor Sewer District. This agency is responsible only for the interceptor system; the existing Utility Districts in this section of Mississippi (the Southaven Utility District, the Delta Utility Company and the Horn Lake Water Association) will connect their collection systems to the interceptor and pay the Interceptor Sewer District for the transport and treatment of the wastes from their respective service areas. The City of Memphis will construct and operate that portion of the project located in Tennessee, and they will charge the Horn Lake Creek Interceptor Sewer District for the treatment of sewage at their South Memphis Sewage Treatment Plant.

1.2 Project History

As one might predict, the planning for this interstate project was difficult. Though the need for a regional system of wastewater treatment was recognized in the late 1960s (the lagoon systems and package plants being utilized by the Mississippi Utility Districts were polluting the Horn Lake Creek as it flowed through Mississippi and into the City of Memphis), it was not until several months ago that the joint project was finally submitted for EPA approval and funding.

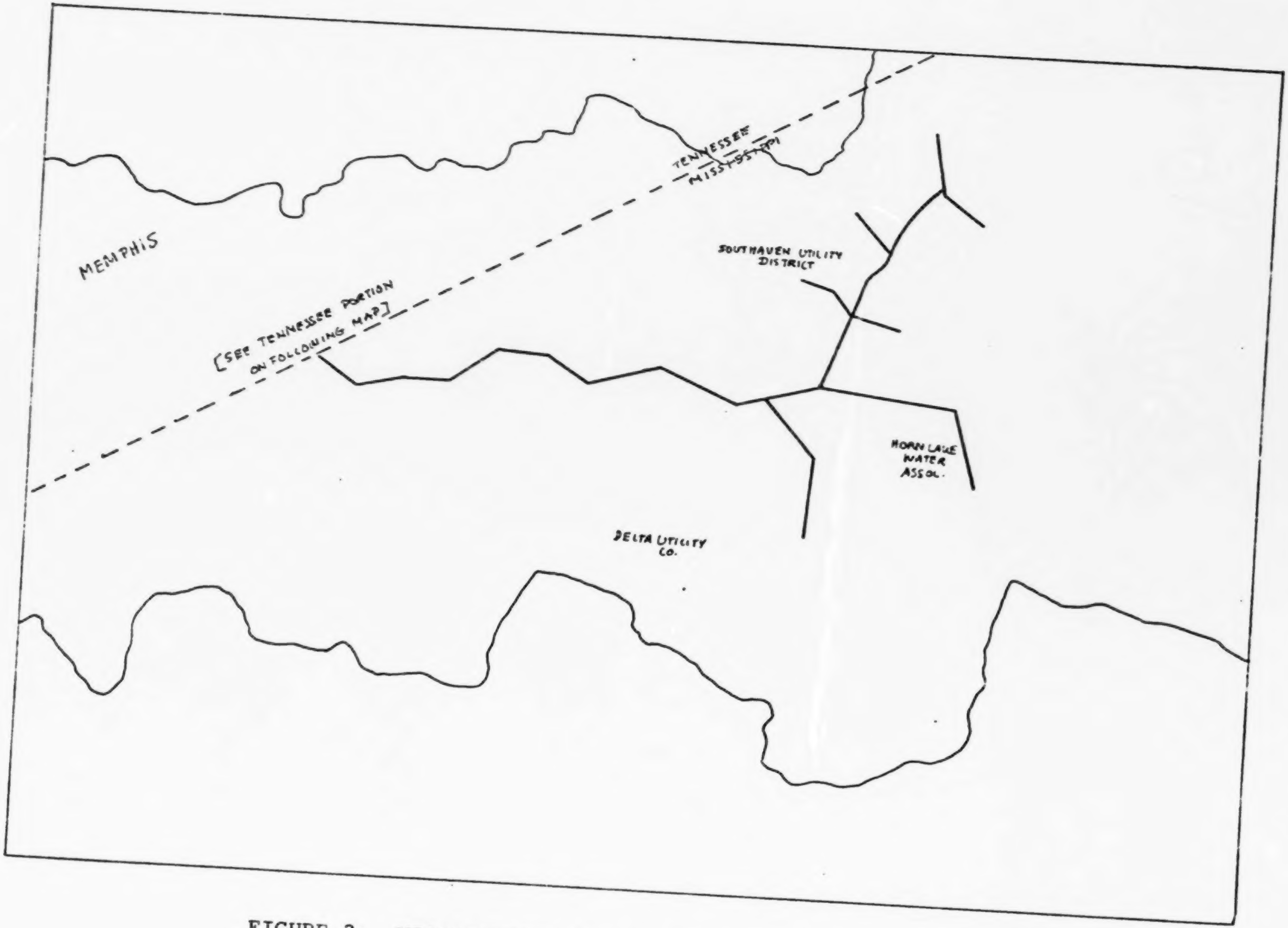

MEMPHIS
TENNESSEE
MISSISSIPPI
[SEE TENNESSEE PORTION ON FOLLOWING MAP]
SOUTHAVEN UTILITY DISTRICT
HORN LAKE WATER ASSOC.
DELTA UTILITY CO.

FIGURE 2: MISSISSIPPI PORTION OF HORN LAKE CREEK INTERCEPTOR

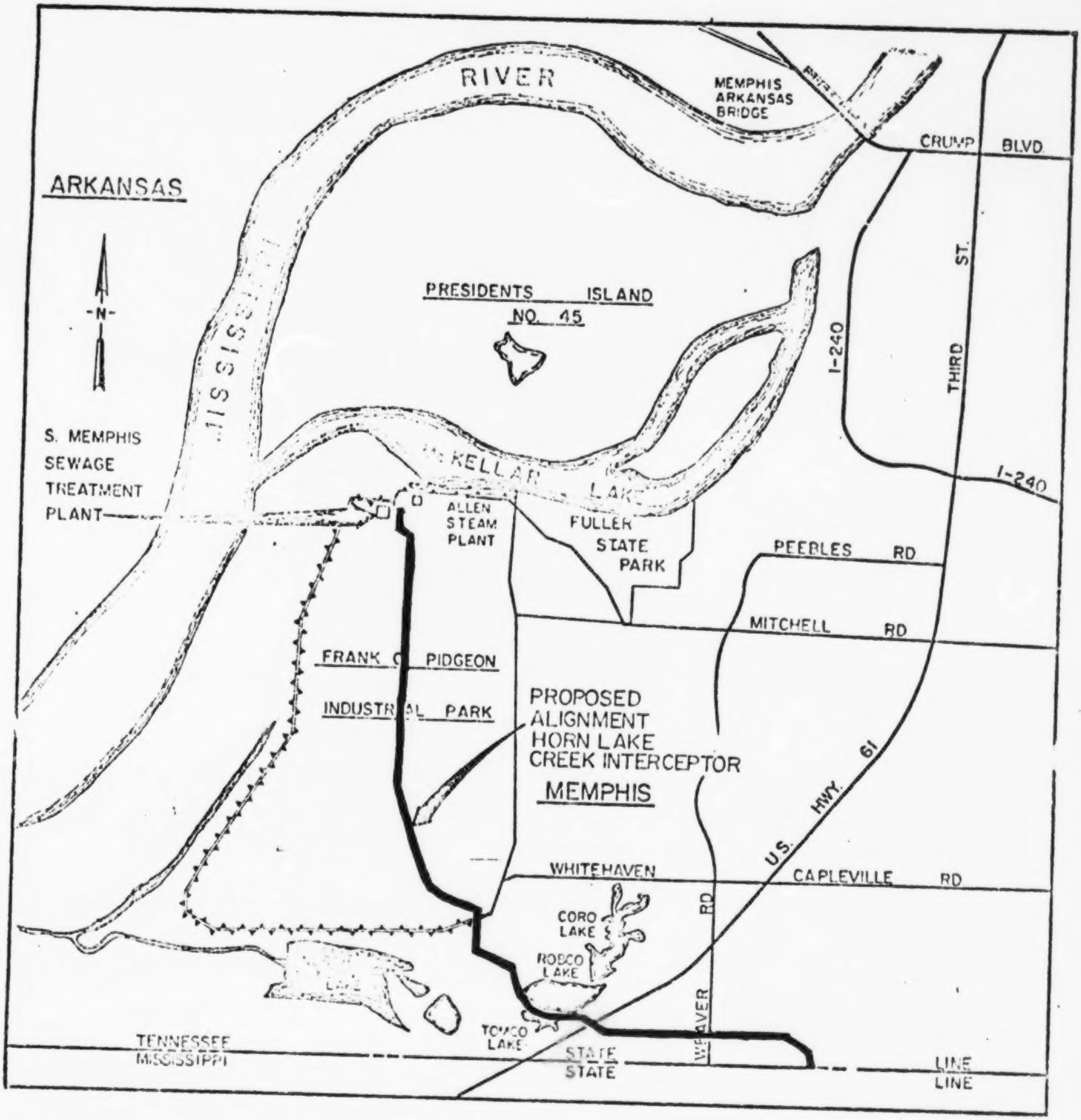

RIVER
MEMPHIS
ARKANSAS
BRIDGE
CRUMP BLVD
ARKANSAS
N
MISSISSIPPI
PRESIDENTS ISLAND
NO. 45
I-240
THIRD ST.
I-240
S. MEMPHIS
SEWAGE
TREATMENT
PLANT
McKELLAR LAKE
ALLEN
STEAM
PLANT
FULLER
STATE
PARK
PEEBLES RD
MITCHELL RD
FRANK C. PIDGEON
INDUSTRIAL PARK
PROPOSED
ALIGNMENT
HORN LAKE
CREEK INTERCEPTOR
MEMPHIS
U.S. HWY. 61
WHITEHAVEN
CAPLEVILLE RD
CORO
LAKE
ROBCO
LAKE
TOMCO
LAKE
WEAVER RD
LAKE
TENNESSEE
MISSISSIPPI
STATE
STATE
LINE
LINE

FIGURE 2
TENNESSEE PORTION: HORN LAKE CREEK INTERCEPTOR

The primary cause of delay was the differing priorities given to the project by Mississippi and Tennessee. Mississippi has given the project high priority since federal funds for sewage treatment were first made available. This state formed the Interceptor Sewer District in May, 1971, and proposed two alternatives: construction of the interceptor to the Mississippi/Tennessee state line and construction of a new Mississippi Sewage Treatment Plant or construction of an interstate interceptor, with the treatment at the existing South Memphis plant.

Initially, Tennessee agreed to participate in the project, and consulting engineers were hired by both the Mississippi Interceptor Sewer District and the City of Memphis to prepare applications for federal funding for their respective components of the system. However, when the PL92-500 priority system was developed, this project was given very low priority both by the state of Tennessee and the City of Memphis since it affected only a relatively small population in Tennessee but would cost a great deal to develop. They decided against immediate cooperation on the project, preferring to finance other projects with their limited state EPA allotment. Mississippi then proceeded with plans for treating their own wastes at the state line.

Recently, however, the EPA regional office determined that the single state solution to the pollution problems of the basin was simply not cost effective, and was undesirable in terms of water quality standards. In order to encourage Tennessee to give the project immediate priority, they helped to negotiate a compromise solution whereby Mississippi would transfer to

Tennessee a portion of its state EPA allottment to pay for some, though not all, of the construction costs for the Tennessee portion of the project. Though Tennessee still does not believe this is the most effective use of their funds committed to the Memphis area, they agreed to the compromise. A Step 1/Step 2 grant was given to each state for preliminary design, and a Step 3 grant was recently awarded for the construction phase. Only one problem now remains. Arrangements for the payment of operating costs for sewage transport (via the interceptor) and treatment (at the Memphis plant) must be finalized between the local Utility Districts in Mississippi who collect user charges and the HLC Interceptor Sewer District and the City of Memphis who have no power to directly assess charges on users of the system. At present, there is a controversy over the establishment of minimum monthly transport and treatment charges which will cover fixed operating cost in the event that the initial sewage flows do not provide sufficient revenues. Regional office staff do not anticipate that these difficulties will halt project construction; local officials view the problems somewhat more seriously but are working hard to resolve the financial disagreements.

1.3 Project Purpose

This project is clearly designed to solve existing pollution problems in the Horn Lake Creek Drainage Basin, and permit residential and commercial/industrial development to continue unconstrained by inadequate sewage treatment systems. Currently, there are three lagoon treatment systems and three package plants in operation in the developed sections of DeSoto County, and the Creek is noticeably polluted by the inadequate treatment they provide. The State of Mississippi does not now allow septic tanks on less than three acre lots; package plants are prohibited, and other treatment facilities are permitted to open and operate only on temporary permits pending the construction of the interceptor. Thus, any new development in the area is dependent upon the building of the interceptor. Assuming, as nearly all local officials do, that development of this basin is both inevitable and desirable, the EPA project will provide for a cost-effective solution to the wastewater treatment needs of future development, while ensuring that the existing sewage treatment facilities will be able to meet the stricter water quality standards that have already been imposed, but are not currently being met.

2. Land Use Planning

2.1 Land Use and Population Trends

Prior to 1960, the service area for the proposed interceptor consisted largely of rural farmland and forests, with some low density housing development in Tennessee just south of the then existing Memphis city limits. However, with the rapid growth of the Memphis metropolitan area in the 1960s, this pattern of land use changed dramatically. Vacant land in south Shelby County was developed into moderate income residential use and the Pidgeon Industrial Park was planned for the area just south of the Memphis Sewage Treatment Plant. This area was then annexed by the City of Memphis down to the Mississippi/Tennessee state line. At the same time, the low property and income tax structure of DeSoto County began to attract individuals moving into the Memphis metropolitan area, and northern DeSoto County rapidly developed into a series of moderate income bedroom communities. Although Mississippi state planners desire to attract major industry and commerce into their state and have thus set aside land within the service area for industrial and commercial use, new development in DeSoto County has continued to consist primarily of moderate-priced housing and strip commercial supporting facilities.

At the present time, an estimated 80% of the service area is vacant and unsewered, and 75% of this land is developable (since Horn Lake Creek floods periodically, a wide flood plain cannot be developed in the forseeable future). The land in Tennessee will develop one-half industrial and one-half residential; though both industry and housing currently exists throughout this area, densities are expected to increase. The larger portion of the service area, located in Mississippi, will probably develop into moderate and high density residential use, though efforts will be made to produce a more balanced economy by attracting industries and light commercial development. The existing residential development suggests that urban sprawl patterns will continue, with single family developments constructed farther and farther from downtown Memphis. Some high density units have been developed in the Southaven area of the drainage basin, however, and more apartment development is anticipated.

Though past population figures were not isolated for the drainage basin, DeSoto County was the fastest growing county in Mississippi from 1960-1970. The 67% population increase during this decade is attributed almost entirely to growth in northern DeSoto County, in the Southaven area in particular (see the Southaven case study). In 1970, the population of the drainage basin was estimated to be 20,000 persons, 15,000 living in northern DeSoto County and 5,000 living in the Memphis/Shelby County portion of the service area. The 1974 population is estimated at 34,000; 27,000 in Mississippi and 7,000 in Tennessee. Though planning estimates for the year 2000 vary slightly depending on the source, it is generally anticipated that slightly over 200,000 persons will live in the drainage basin by this time. (Ultimate population projections for the basin at full development varied greatly, with the Memphis consulting engineers estimating 410,000 persons for the drainage basin (based on a density of twelve persons/acre), while the HLC Interceptor Sewer District consulting engineers estimating only 265,000 persons in the Mississippi portion of the basin, where it is agreed 90% of the population of the basin will reside.)

2.2 Land Use Planning Agencies and Land Use Controls

Three planning agencies are involved in planning for either all or parts of the interceptor service area: the DeSoto County Planning Commission, the Memphis/Shelby County Planning Commission, and the Mississippi-Tennessee-Arkansas Council of Governments (MATCOG). To date, the county planning commissions have assumed the major share of responsibility for the population and land use planning that has been done, though MATCOG is now becoming more involved in this process as the need to regionalize all aspects of planning for the metropolitan area has become an accepted fact.

The Memphis/Shelby County Planning Commission appears to focus little attention on land use planning in the service area of the proposed interceptor, except for the development of the Pidgeon Industrial Park. The area not devoted to the park is already developed in low-density residential use and it is not one of the faster growing areas of the city. The agency anticipates that residential densities here will increase relatively slowly, and that there will be no major problems in this evolving land use process.

The DeSoto County Planning Commission considers the area surrounding Horn Lake Creek to be its highest priority planning area, and thus, it has focused its planning efforts in this section of the county. However, as discussed in some detail in the Southaven case study, this Planning Commission has been unable to keep up with the recent acceleration of development in the county, and its major efforts now appear to be coordinating the plans of the developers with county regulations and service agencies rather than positive planning.

MATCOG, while as yet uninvolved in land use decision-making, appears to be a potentially influential organization. They have developed interim land use plans for the area, as well as a plan for wasterwater pollution control systems based on a regional solution concept. They are the single A-95 agency for all federal grants in the Memphis area of Tennessee, and they also have A-95 authority in DeSoto County (they share this with the North Delta Planning and Development District of Mississippi; however, the North Delta PDD is not at present active in land use planning for DeSoto County). To date, however, MATCOG has not assumed an active role in either projecting or planning for future population or land use in the two affected counties--they rely on the county planning staffs to provide them with information and focus their efforts on coordinating region-wide plans.

Land use controls in both counties, as in many rapidly developing areas that have not experienced problems of over-development, are largely developer-oriented. Plans to bring industry, commerce, or housing into vacant land areas are viewed very positively by the county officials, and every effort is made to ensure that the minimum services necessary to enable the developer to proceed with his plans are provided. Though a few individuals on the Memphis/Shelby County Planning Commission expressed concern over the encouragement given to move the population from the center city to the rapidly expanding suburban perimeter, there appears too little, if any, movement toward the control of this trend. Memphis has resolved the problem of a declining tax base by annexing suburban areas as they develop. In DeSoto County, however, the rural tax structure remains as an encouragement to development and the financial difficulties that will undoubtedly be encountered in attempting to provide services to an urbanized area have not yet been confronted.

2.3 Land Use and Population Data Utilized in the Design of the Interceptor Projects

When the Horn Lake Creek Interceptor was first planned as a joint project in 1971, both Mississippi and Tennessee hired consulting engineers to perform preliminary studies. These consulting engineers assumed responsibility for the development of the land use and population projections use in sizing their respective components of the interceptor, but both used data from the DeSoto County and Memphis/Shelby County Planning Commissions which projected population to the year 2000, and outlined anticipated land use within the area.

The engineer hired by the Horn Lake Creek Interceptor Sewer District confined his population and land use projections to that portion of the service area lying within Mississippi, while the engineer hired by the City of Memphis estimated population and land use for both the Mississippi and Tennessee portions of the service area. Perhaps because the engineers used different methods in determining what proportion of the DeSoto County population projections should be attributed to growth within the HLC drainage basin, they listed differing population projections for the year 2000 in their respective reports: the Mississippi engineer projecting a population of 150,000 for the Mississippi service area, the Tennessee engineer projecting 183,000 persons for this same geographical area.

Similarly, in estimating ultimate population figures for the Mississippi area (using an ultimate density figure), two different estimates resulted: 265,000 in the Mississippi engineer's report, and 337,000 in the Tennessee engineer's. As a result of these differing estimates, projected ultimate flows, used in the sizing of the interceptor segments, also differed--with the Tennessee engineer projecting a higher flow in the interceptor at the Mississippi/Tennessee state line than the Mississippi engineer. These differing population figures have not, apparently, been reconciled. Though there should be no connection problems (since the Tennessee portion of the interceptor was sized for the higher capacity flow) it is interesting that differing population and flow statistics have been employed without any reconciliation.

The engineering reports for the two segments of the interceptor contained only minimal land use data--projected land use maps obtained from the respective planning commissions. These maps apparently were used to estimate industrial versus residential flow without any independent analysis by the engineers. It is forecast that the major proportion of the land in Mississippi will develop into residential use, with some allowance for industrial development, but that the vacant land in Tennessee will develop primarily industrial. Neither the DeSoto County Planning Commission, the Memphis/Shelby County Planning Commission, or MATCOG were involved in the planning process, though they did approve the plans as developed by the engineers.

3. The Land Use Impact Evaluation Process

3.1 Governmental Review

The two county planning commissions charged with land use planning responsibility were never actively involved in either the planning or the review of the Horn Lake Creek Interceptor project. At the time initial plans were being made, the DeSoto County Planning Commission employed only one planner who was far too busy to play an active role. This may, however, change with respect to future grant applications, since MATCOG is now charged with the responsibility for developing the region-wide 208 facilities plan (required by PL-92-500) for the Memphis area. With respect to this project, however, staf staff at this agency do feel that development of this drainage basin is inevitable, that the large population projections for the area are realistic, and that the interceptor should be constructed as planned, as soon as possible.

Review by the respective state water quality agencies focused on the priority to be given the project, and did not include any assessment of land use impacts. Though the state agencies differed on their ranking of the project within their priority systems, they believe that the land use and population projections for the area are accurate, and that the interceptor is properly sized.

The regional EPA office in Atlanta did assess the population projections contained in the engineering reports and found them consistent with metropolitan area growth data available from sources other than the respective county planning commissions. Though they do recognize that this project will serve to open a large area of land for development, they do not feel that they have a mandate to investigate the land use planning implications and have left this task to the state and local agencies involved.

3.2 Non-Governmental Involvement

Developers active in the area clearly welcome the interceptor, since the more stringent water quality standards would make it impossible to carry out large scale development of the drainage basin without this or a similar regional wastewater treatment system. Clearly, the state and local governments were influenced by the needs of the developers, since both Tennessee and Mississippi are actively encouraging development in their respective service areas. In one instance a proposed route for the interceptor was changed to accommodate specific development needs: the Tennessee portion of the sewer line was rerouted to provide better service to the Pidgeon Industrial Park. According to individuals who were involved in the early planning process, developers have followed the progress of the interceptor planning very carefully and have based their own plans for development on the sewer plans made. There is a general consensus that developers active in DeSoto County are not prepared to finance large sewage transport and treatment programs should other funding sources be cut off. Thus, further large scale development is dependent on governmental initiatives. Developers are willing, however, to pay some of the extra costs for sewage facilities, and so can be counted on as a source of revenue to repay loans obtained to finance the local share of the project.

According to everyone interviewed on this project, there has been no objection registered from the general public. At a recent public hearing held prior to the award of the Tennessee portion of the EPA grant, one Tennessee resident voiced concern over possible breakage of the line near the residential development in which he lived, but also expressed approval of the decision to replace a nearby oxidation pond with the interceptor line. No other citizens or groups registered anything but support for the project. With respect to the Mississippi portion of the project, it could not be determined whether a public hearing had been held although an environmental assessment was prepared in 1973 prior to the requirement for public hearings. However, the project has received extensive publicity in the local county paper (since it is a large federal grant with respect to other funds received) and no interest in or objection to the proposed project has been voiced.

4. Influence of the Land Use Impact Evaluation

As discussed in the preceding section, no formal consideration has been given to the land use implications of the proposed project, and no objections have been registered by those outside the planning process. To a great extent, this reflects the fact that the Memphis metropolitan area has yet to experience any of the adverse impacts of over-development or unplanned development. Individuals who live on the perimeters of the developed area can still drive to work without encountering traffic congestion, the energy shortage did not have any noticeable impact on energy resources available to citizens, and there are still large sections of developed residential areas open for recreational use. Furthermore, there is little incentive for county officials to oppose sewer projects which will promote rapid development. The county officials represent the property owners in the area, the developers are stimulating a rise in the value of property, and rapid rates of population increase and development can be beneficial to both groups. Since there are no individuals or land use organizations within this area who have a strong immediate interest in opposing this development, there is no incentive to study potential adverse secondary impacts.

5. Other Project Attributes Affecting Land Use

5.1 Project Staging

All segments of the Horn Lake Creek interceptor will not be constructed immediately. Branches reaching into sub-basins of the Creek's drainage basin will be constructed only as development moves into each area, and the eastern end of the main interceptor will not be constructed until there is a need in this area. Thus, while the interceptor as planned for immediate construction will open large portions of the drainage basin area for development, efforts have been made to place highest priority on serving existing developed areas.

However, the decision was made to size the segments of the interceptor now being constructed for the ultimate population of the service area. Initially, sizing for a 1995 population was considered, but this option was rejected because the cost of paralleling the line at a later date was not a cost effective solution.

Clearly, both the decision to stage construction of segments of the line and not to stage the sizing of the lines constructed have land use implications. The former decision will, at least temporarily, have an impact on locations of development, since the developers will work in areas served by the first phase of interceptor construction. The latter decision will, however, permit rapid development of the entire basin area because capacity of the line will not be a constraint. However, in making these decisions, there appears to have been no consideration given to these issues; rather the decisions were made solely on the basis of weighing costs of construction and available funding.

5.2 Project Financing

The financial arrangements made by Tennessee and Mississippi differ for their respective portions of the project, and will be discussed separately.

Tennessee's portion of the construction costs will be financed 75% by federal funding ($5.7 million of which were transferred from

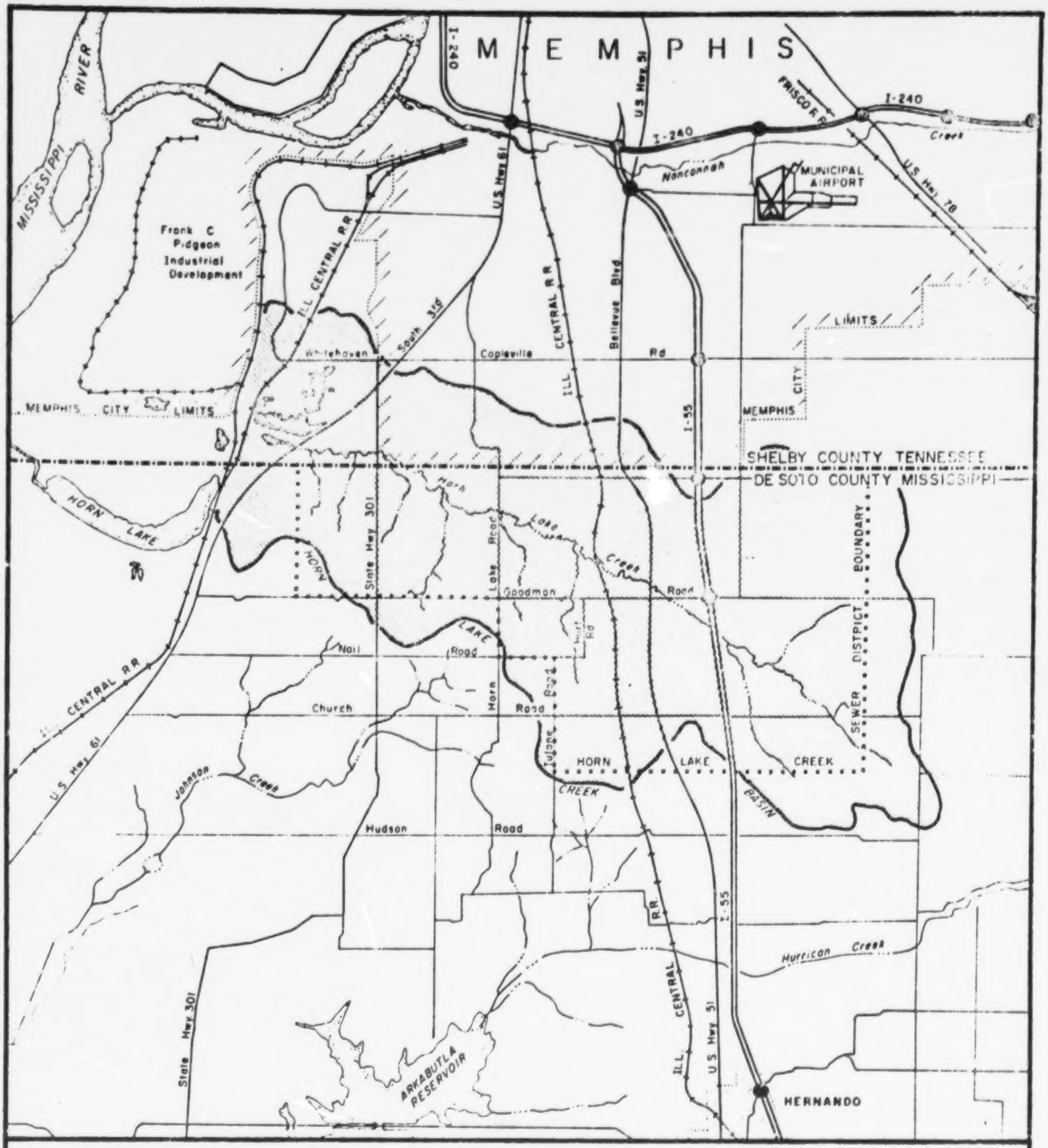
Mississippi to Tennessee to encourage Tennessee to participate in the project) and 25% from funds raised through revenue bonds issued by the City of Memphis. Since there are existing users in the service area, and industries present or committed to the industrial park, they do not anticipate any problems in the repayment of these bonds. Operating costs will be paid by both the users in Tennessee and by flow charges levied by Memphis on the Horn Lake Creek Interceptor Sewer District for flows crossing into Tennessee from the HLC basin. To ensure that sufficient revenue will be available during the early years of project operation, Memphis and the HLC Interceptor Sewer District have agreed upon a minimum charge for transport and treatment to be paid by the Interceptor Sewer District to the City of Memphis during the early years of project operation.

Half of Mississippi's 25% non-federal share will be initially raised through an interest-free state loan, and the other half through a low interest Federal Housing Authority (FHA) loan. The repayment of these loans is an issue which is now in controversy, as is the payment of on-going operating costs for sewage transport and treatment. The Interceptor Sewer District anticipated two primary sources of revenue to pay their costs--charges levied on developers ($100 per new lot) and a portion of the user charges imposed by the Utility Districts operating in the area. However, this scheme has encountered opposition. The FHA's policy is to require repayment plans to be based in existing sources of revenues, and does not consider the developer charges a reliable indication of capability to pay off their loan and the utility districts appear to be reluctant to commit themselves to a minimum annual payment sufficient to ensure that the Interceptor Sewer District can meet its obligations to the City of Memphis.

These two problem areas, which are now being negotiated, are a direct result of the development orientation of the project. If development continues at its pace during the late 1960s and early 1970s (when these plans were made), there would be no problems. New development would be assessed a large portion of the construction costs through the $100 development fee, and the utility districts could be reasonably confident that user charges would rapidly meet and probably exceed the annual minimum charge for sewage transport and treatment that was established. However, the recent slump in housing sales (just hitting this area in the past year) has made the agencies involved more cautious about the commitments they make. If the recent trend were to continue for a protracted period, existing users would be forced to pay a disproportionally high share of the costs of the interceptor project, and all agencies concerned wish to avoid this result. Though no one anticipates that this area will not develop as projected over the next thirty years (for its growth is considered inevitable given its location) the rate of development over the next few years could continue to be affected by regional and national economic trends.

APPENDIX

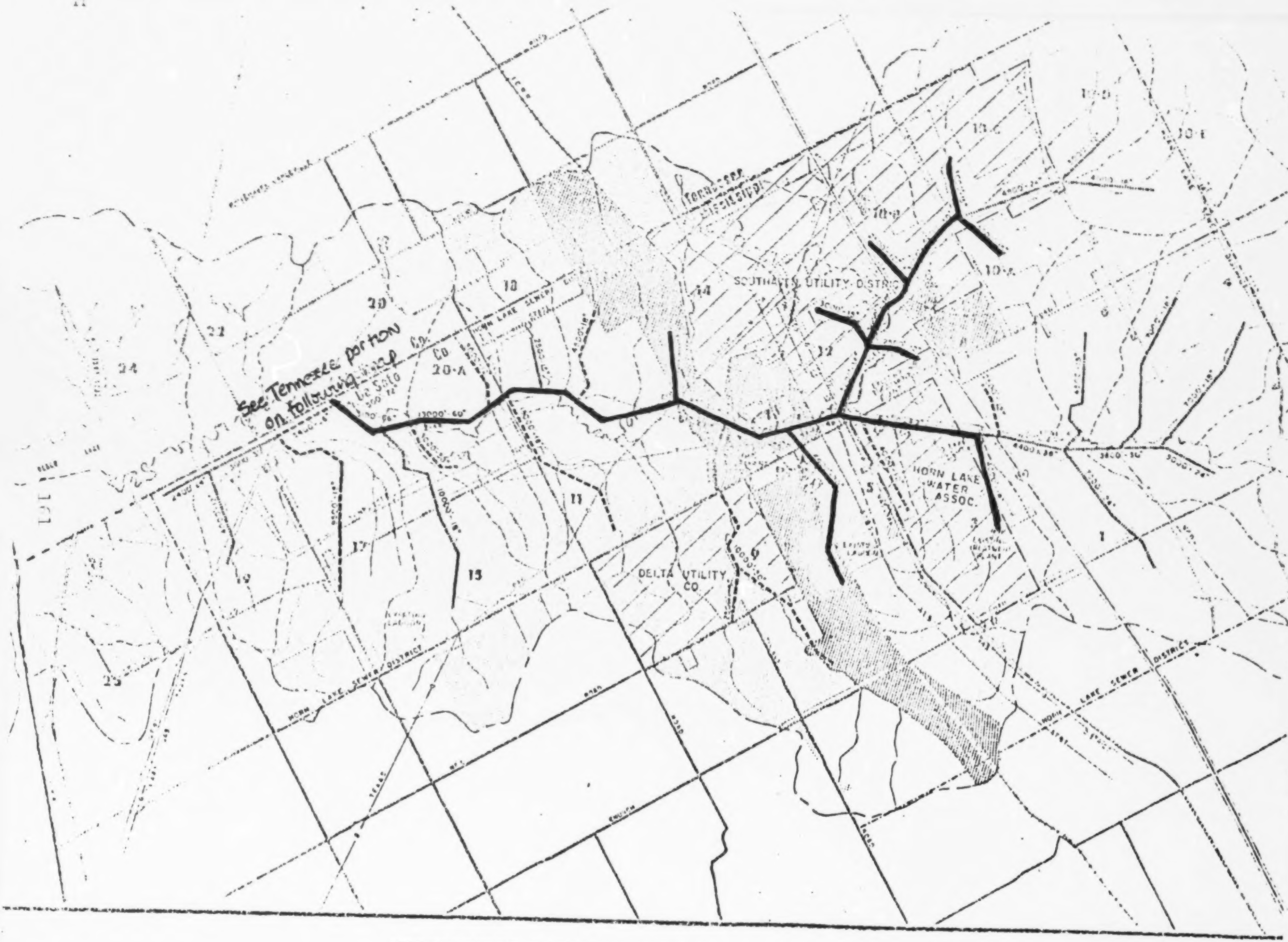
HORN LAKE CREEK INTERCEPTOR


MEMPHIS
I-240
MISSISSIPPI RIVER
U.S. Hwy 61
U.S. Hwy 51
FRISCO R.R.
I-240
Creek
Nonconnah
MUNICIPAL AIRPORT
U.S. Hwy 78
Frank C Pidgeon Industrial Development
ILL CENTRAL R.R.
ILL CENTRAL R.R.
Bellevue Blvd
South 3rd
LIMITS
Whitehaven
Coplleville
Rd
MEMPHIS CITY LIMITS
I-55
MEMPHIS CITY
SHELBY COUNTY TENNESSEE
DE SOTO COUNTY MISSISSIPPI
HORN LAKE
Horn Lake Creek
HORN
State Hwy 301
Lake Road
BOUNDARY
Goodman Road
LAKE
Hurt Rd
Nail Road
DISTRICT
ILL CENTRAL R.R.
Church Road
Horn Road
Tulane Road
SEWER
HORN LAKE CREEK
CREEK
BASIN
U.S. Hwy 61
Johnson Creek
Hudson Road
R.R.
I-55
Hurrican Creek
State Hwy 301
ARKABUTLA RESERVOIR
ILL CENTRAL
U.S. Hwy 51
HERNANDO
N
Scale In Miles
1
0
1
2
3

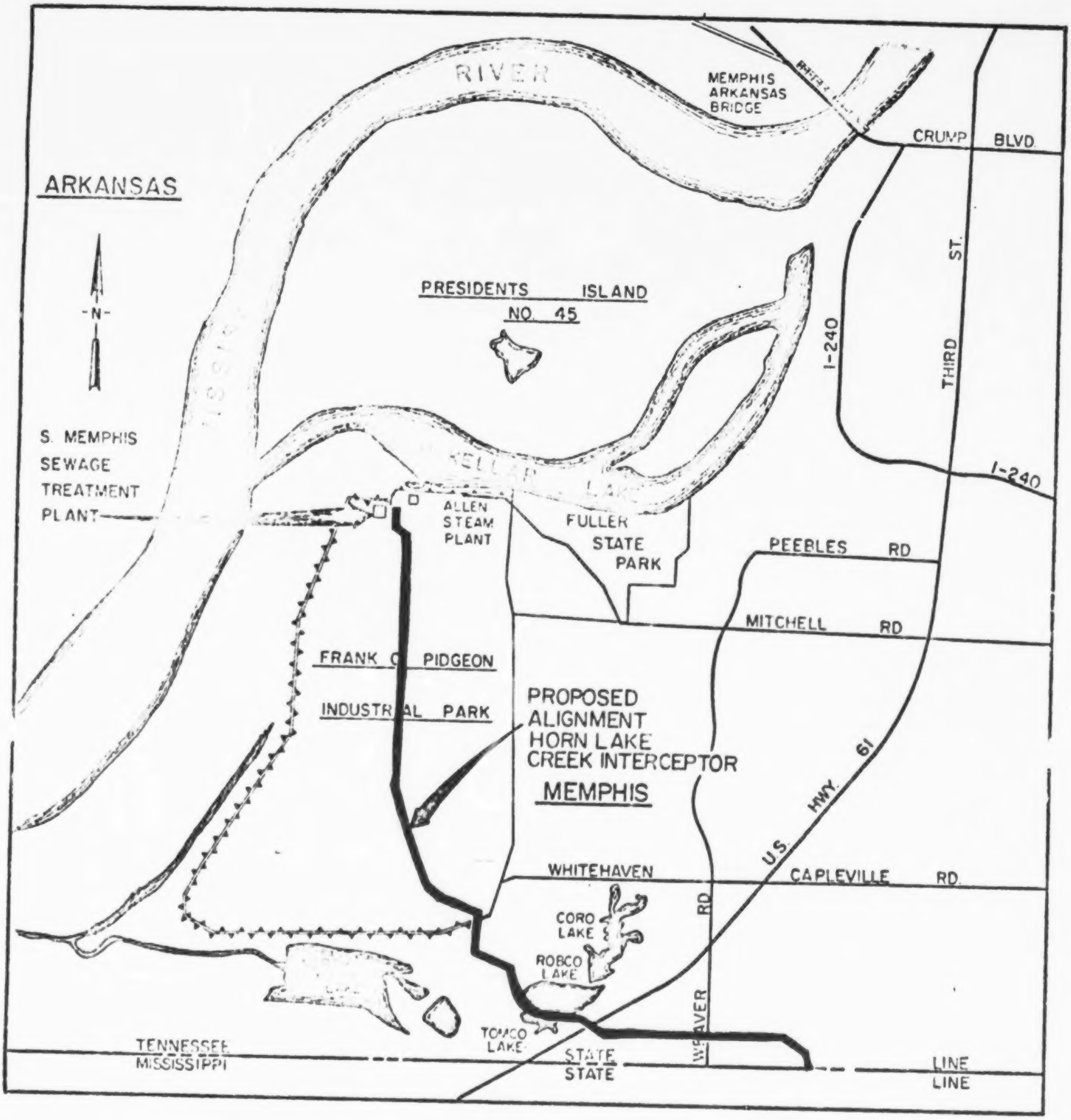
HORN LAKE CREEK BASIN
INTERCEPTOR SEWER DISTRICT
HORN LAKE, MISSISSIPPI

VICINITY MAP

MICHAEL BAKER, JR., INC. — CONSULTING ENGINEERS
Jackson, Mississippi
June, 1972


Tennessee
Mississippi
SOUTHAVEN UTILITY DISTRICT
HORN LAKE WATER ASSOC.
DELTA UTILITY CO.
HORN LAKE SEWER DISTRICT
HORN LAKE SEWER DISTRICT
See Tennessee portion on following map
De Soto Co
20-A
20
22
24
23
21
19
17
15
11
9
5
3
1
12
14
16
18
10-A
10-B
10-C
10-D
10-E

MISSISSIPPI PORTION: HORN LAKE CREEK INTERCEPTOR
(Heavy line indicates Phase I)


RIVER
MEMPHIS
ARKANSAS
BRIDGE
CRUMP BLVD.
ARKANSAS
N
PRESIDENTS ISLAND
NO. 45
THIRD ST.
I-240
I-240
S. MEMPHIS
SEWAGE
TREATMENT
PLANT
KELLAR
LAKE
ALLEN
STEAM
PLANT
FULLER
STATE
PARK
PEEBLES RD
MITCHELL RD
FRANK C. PIDGEON
INDUSTRIAL PARK
PROPOSED
ALIGNMENT
HORN LAKE
CREEK INTERCEPTOR
MEMPHIS
U.S. HWY. 61
WHITEHAVEN
CAPLEVILLE RD.
CORO
LAKE
ROBCO
LAKE
WEAVER RD
TOMCO
LAKE
TENNESSEE
MISSISSIPPI
STATE
STATE
LINE
LINE

TENNESSEE PORTION: HORN LAKE CREEK INTERCEPTOR

STATISTICAL DATA ON THE HORN LAKE CREEK INTERCEPTOR

Length: 21.3 miles

Type: Gravity

Service Area: 40,000 acres

Initial population: 34,000

2000 Population: 208,000*

Ultimate population: 410,000*

Flows:

2000 Residential Flow: 16.0 MGD
2000 Industrial Flow: 11.3 MGD

Capacity Flow/Ultimate: 125.9 MGD (peak)

Financial Information:

Accurate cost data for this project was difficult to develop for the purposes of this case study, for the engineering reports differed on proposed cost, costs kept rising with inflation, and the actual construction grants were not awarded until very recently and this information was not available until the last week of the study.

The cost estimates used in the excess capacity analysis were gathered from proposed costs developed in late 1973 and early 1974, and were as follows:

Tennesse Interceptor: $10,323,205.
Mississippi Interceptor: $ 5,539,000.

Total HLC Interceptor: $15,862,205.

However, the recent grant awards indicated that the cost figures had been substantially increased. EPA based its awards on the following total cost projections:

Tennessee Interceptor: $12,362,300.
Mississippi Interceptor: $ 6,994,750

Total HLC Interceptor: $19,357,050

To cover this cost, the following sources of funds have been secured, or our in the final stages of negotiation:

EPA Grant to Tennessee (includes 5.7 million from Mississippi state allottment)	$ 8,267,475.
EPA Grant to Mississippi:	$ 5,102,400.
City of Memphis	$ 4,094,825.
Mississippi State Loan to HLC Interceptor Sewer District	$ 850,350.
FHA Loan (proposed) to HLC Interceptor Sewer District	$ 1,042,000
	$ 19,357,050.

TENNESSEE ENGINEER'S ESTIMATES OF POPULATION

PROJECTED
POPULATION OF
HORN LAKE CREEK BASIN

Year	DeSoto County *	City of Memphis **	Total	
1970	15,000	5,000	20,000	75% in DeSoto
1971	17,300	5,500	22,800	
1972	20,000	6,000	26,000	
1973	23,200	6,500	29,700	
1974	27,000	7,000	34,000	
1975	31,500	7,500	39,000	
1976	36,800	8,000	44,800	
1977	42,500	8,500	51,000	
1978	49,500	9,000	58,500	
1979	58,000	9,500	67,500	
1980	67,000	10,000	77,000	< 90%
1981	72,800	10,600	83,400	
1982	78,600	11,200	89,800	
1983	84,400	11,800	96,200	
1984	90,200	12,400	102,600	
1985	96,000	13,000	109,000	
1986	101,800	13,600	115,400	
1987	107,600	14,200	121,800	
1988	113,400	14,800	128,200	
1989	119,200	15,400	134,600	
1990	125,000	16,000	141,000	< 90% in [illegible]
1991	130,800	16,900	147,700	
1992	136,600	17,800	154,400	
1993	142,400	18,700	161,100	
1994	148,200	19,600	167,800	
1995	154,000	20,500	174,500	
1996	159,800	21,400	181,200	
1997	165,600	22,300	187,900	
1998	171,400	23,200	194,600	
1999	177,200	24,100	201,300	
2000	183,000	25,000	208,000	< 90%

* Data from DeSoto County Planning Commission
** Data from Memphis & Shelby County Planning Commission

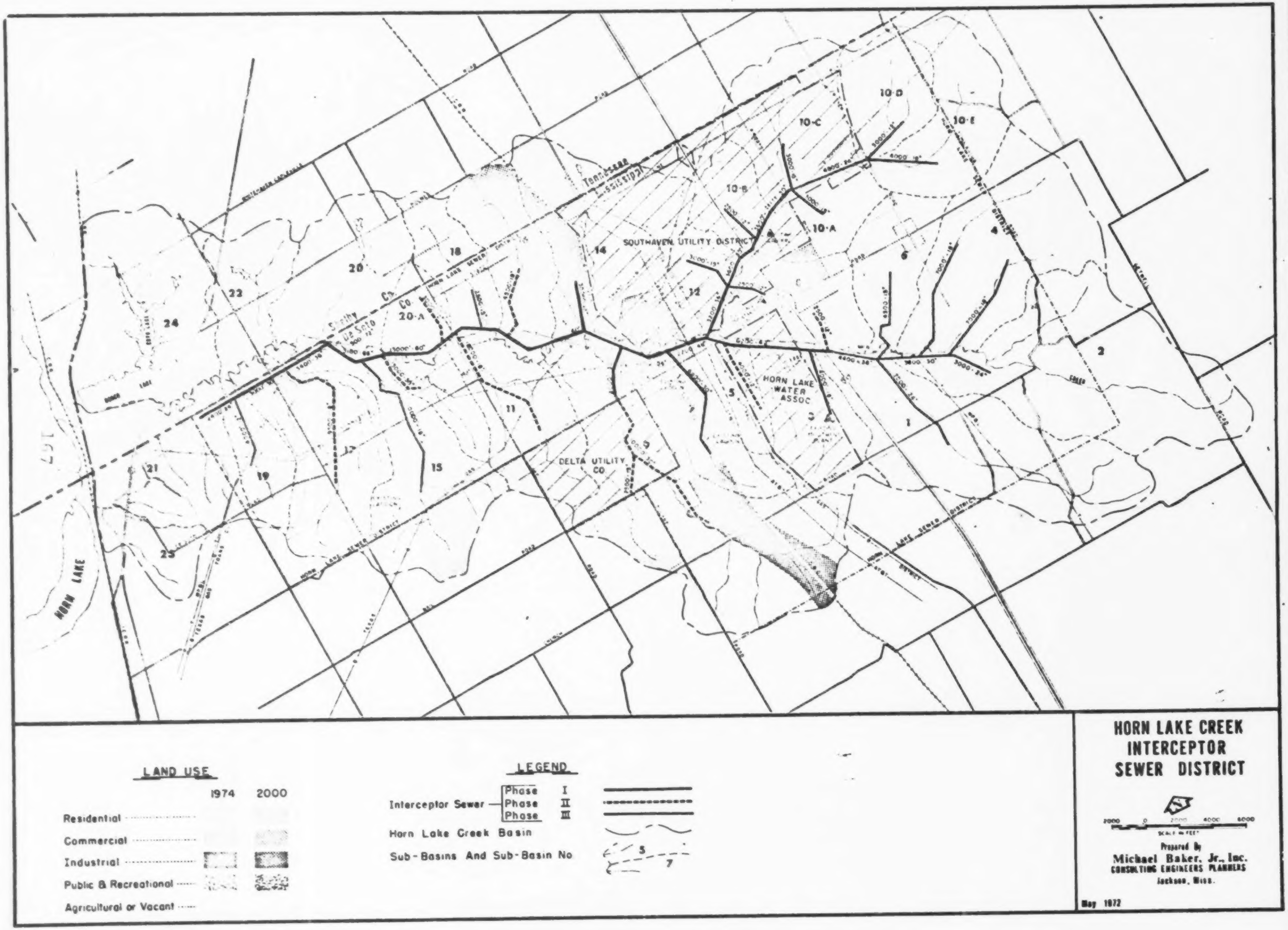
MISSISSIPPI ENGINEER'S POPULATION PROJECTIONS

(DOES NOT INCLUDE POPULATION
IN TENNESSEE PORTION)

HORN LAKE CREEK BASIN INTERCEPTOR SEWER DISTRICT

YEAR	POPULATION
1971	19,630
1972	23,960
1973	28,290
1974	32,620
1975	36,950
1976	41,280
1977	45,610
1978	49,940
1979	54,270
1980	58,600
1981	62,960
1982	67,320
1983	71,680
1984	76,040
1985	80,400
1986	84,760
1987	89,120
1988	93,480
1989	97,840
1990	102,200
1991	106,980
1992	111,760
1993	116,540
1994	121,320
1995	126,100
1996	130,880
1997	135,660
1998	140,440
1999	145,220
2000	150,000
Ultimate	265,132

*Source: DeSoto County Planning Commission


Tennessee
Mississippi
Shelby Co.
De Soto Co.
Southaven Utility District
Horn Lake Water Assoc
Delta Utility Co
Horn Lake
Horn Lake Sewer District
1
2
4
5
6
9
10-A
10-B
10-C
10-D
10-E
11
12
14
15
17
18
19
20
20-A
21
22
24
25
LAND USE
1974
2000
Residential
Commercial
Industrial
Public & Recreational
Agricultural or Vacant
LEGEND
Interceptor Sewer
Phase I
Phase II
Phase III
Horn Lake Creek Basin
Sub-Basins And Sub-Basin No
5
7
2000
0
2000
4000
6000
Scale in feet

HORN LAKE CREEK INTERCEPTOR SEWER DISTRICT

Prepared By
Michael Baker, Jr., Inc.
CONSULTING ENGINEERS PLANNERS
Jackson, Miss.

May 1972

Southaven, Mississippi

1.0 Introduction

1.1 Project Description

Southaven is a small, unincorporated residential area located in the extreme northcentral portion of DeSoto County, Mississippi, just south of the Tennessee/Mississippi state line and adjacent to the southern corporate limits of the City of Memphis, Tennessee. Prior to 1960, Southaven was a rural community of scattered residences and commercial establishments strung out along Highway 51. However, with the construction of a series of major highways linking the area to Memphis, residential development from Memphis began to spill over the state line into Southaven and the development trend began to accelerated rapidly. From virtually no urban population in 1960, the Southaven area increased to 6,500 people in 1967, 8,931 in 1970 and an estimated 13,000-14,000 people in late 1973. Over the past few years, 300-400 homes have been constructed annually, resulting in a population increase of 1,000-2,000 per year, or an annual growth rate of 10-12%.

To accommodate the sudden residential development, an initial water and sewer system was constructed by the privately owned DeSoto Utility District in late 1961 and 1962. However, by the mid-1960's, it was apparent that utility service needs in the area demanded a public utility service agency. Thus, in 1967 the Board of Supervisors for DeSoto County, acting under a special Mississippi state law, created the Southaven Utility District, which was charged with the responsibility for water works, sanitary sewerage, and fire protection services.

For the past seven years, this Utility District has increased the pace of sewerage collection and treatment programs to keep abreast of the rapidly increasing urban development in the area. (It should be noted at this time that the boundaries for the Utility District are not static; as new development moves into the area, the developers can petition for the provision of water and sewer services, and the boundaries of the District can then be expanded to include these areas. There are, of course, natural geographic boundaries, as well as other existing Utility Districts which will limit increases in the service area. At this time, just under 5,000 acres of land are included in the SUD area. It is anticipated that an additional 5,500 acres of undeveloped land will be included within the District service area by 1985.

The EPA project selected for this case study consists of two interceptor lines, one to serve an existing residential and planned commercial and industrial area in West Southaven, and a second to serve a developing commercial and industrial area in West Greenbrook, a new subdivision located in the eastern portion of the Utility District. (See West Southaven Outfall and West Greenbrook OUtfall on Figure 1.) A Step 1/ Step 2 grant was awarded to finance the planning of these projects, and a Step 3 grant was recently awarded. These interceptors are the highest priority projects in the first phase of a plan to expand the entire existing sewer system.

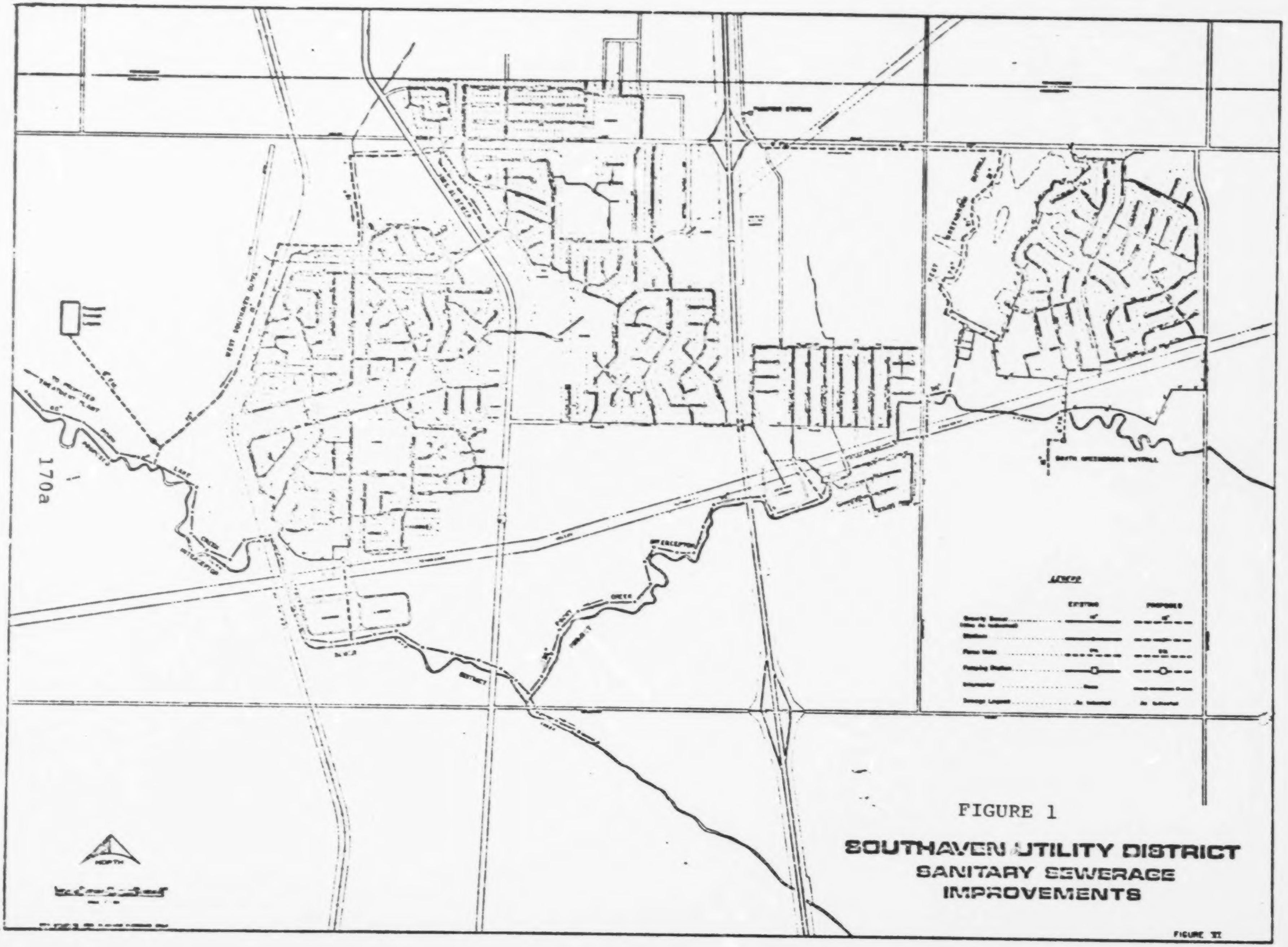


FIGURE 1

SOUTHAVEN UTILITY DISTRICT
SANITARY SEWERAGE
IMPROVEMENTS

1.2 History of the Project

The EPA grant under study had its origins in a request for funds under the PL660 program, when Southaven made application for funding an interceptor to serve the needs of a recently constructed residential development, Greenbrook, located in the eastern portion of its District Boundaries. Though federal staff had approved the plans for this interceptor, the transition from PL660 to PL92-500 delayed and finally cancelled the expected award of funding, and this interceptor was constructed without the anticipated federal support. As a result of the unexpected problems in financing this interceptor, the regional staff encouraged the District to apply for 92-500 funds to construct a second interceptor to serve new development planned for this same general area, and a Step 1/Step 2 grant was awarded for the West Greenbrook interceptor, designed to serve a one-square-mile area where plans for both residential and commercial development are well-established. At the same time, the Southaven Utility District (SUD) also applied for PL 92-500 funds to design an interceptor to serve an established residential area on the West side of the District, where an overloaded interceptor line was not adequate to serve the existing residential area and was unable to accommodate the demands of new commercial development and the development of an industrial park.

Planning for these two new interceptors proceeded steadily; a combined Step 1/Step 2 grant was awarded, a Step 3 application made, and funds just recently approved for Step 3 construction. Throughout the planning process, it has been recognized that the treatment facilities in the SUD which will be used to treat waste from these new interceptors (two existing oxidation ponds and one now in planning) are only temporary. Within the next few years, as soon as the Horn Lake Creek interceptor is constructed, the SUD will connect its interceptor lines to the Horn Lake Creek system for transport and treatment at a South Memphis Treatment Plant. (See the Horn Lake Creek Interceptor case study for a discussion of this project and its relation to the established Utility District programs in the Horn Lake Creek basin.)

1.3 Project Purpose

This project will serve several purposes. The construction of the West Southaven interceptor will relieve an overloaded existing interceptor which now serves an established fully developed residential area. This interceptor will also serve the needs of commercial establishments now under construction in the area to the north and east of the residential area, and will provide a waste disposal system for the Freeport Industrial Park, also under construction at this time. The West Greenbrook interceptor will serve commercial establishments now being constructed in the eastern portions of the District, and will serve a relatively large subdivision now planned for construction in the Greenbrook area.

Though it is true that both interceptors will be serving developments that do not currently exist, the building of sewers prior to the completion of industrial, commercial or residential development is considered essential by sewer district engineers in this section of Mississippi. Septic tanks are not permitted for lots under three acres, and package plants are prohibited. Until a commitment has been made by the Utility District to provide interceptor sewers, developers cannot act. To avoid forcing existing users to pay for the costs of interceptors to serve new development, developers are required to pay a pro-rata share of local costs (the money necessary to repay the 25% non-federal share raised by the SUD through loans) as they connect their collection systems to the interceptor lines.

2.0 Land Use Planning

2.1 General Trends in Population and Land Use

From a rural area with only a few residents and commercial establishments in 1960, Southaven has since developed into a compact, medium density, low-to-moderate income bedroom community for the City of Memphis. Though attempts are now being made to attract income-producing commercial and industrial establishments to Southaven, its proximity to Memphis (20 minutes to the downtown area, less to many major employment locations) makes it an ideal residential area. Most individuals interviewed anticipated that some commercial and industrial development may occur, but that the Southaven area would generally maintain its current character as a residential community where workers from the Memphis Metropolitan area could purchase new homes for relatively low prices.

The U.S. Census Bureau figures for the 1970 population of Southaven was 8,931. Utility District records indicate that the current population (late 1973) is 13,000 to 14,000. Based upon the very rapid growth of the area in the last few years, the population of Southaven is expected to reach 28,400 by 1980 and 40,800 by 1985. Though the current shortage of mortgage money has had a significant impact on the sale of houses in the area over the last six months, all persons interviewed in the County and in the Memphis Metropolitan area agreed that the population forecasts for this area were not unrealistic, since Southaven is the most desirable suburban residential area for low and moderate income families to locate. To a great extent, the rapid population increase in this area reflects the fact that Mississippi state taxes are far lower than those of Tennessee and that the local taxes imposed on the property owners in DeSoto County are a great deal lower than the taxes paid by Memphis residents.

At the present time, the population is concentrated in the 1,760 developed acres of the 5,000 acres within the Utility District's current boundaries. Most residents live in single-family homes on small lots in recently constructed subdivisions. There are also two mobile home parks (not yet served by the SUD). Just recently, three multi-family apartment complexes were constructed, one publicly subsidized under HUD. Though there was some fear that the subsidized unit might bring minority groups from Memphis into the predominantly white

Southaven area and resistance to this development did occur, the Zoning Board supported the developer and the units were constructed without further organized opposition. There appears to be little if any resistance to the concept of multifamily development per se.

An analysis of recent zoning petitions in the area and development trends in the neighboring Whitehaven area of Memphis indicate that Southaven is going to experience some change in land use trends during the next decade. Some industry will undoubtedly develop, due to the construction of the Freeport Industrial Park in the extreme western corner of the SUD. In addition, several hundred acres of land in the central and eastern portions of the District are being considered for high-density, multi-family apartment complexes.

2.2 Land Use Planning and Controls

The DeSoto County Planning Commission, with two full-time planners plus several building inspectors, has primary responsibility for all county planning, plus zoning and land use control. Though they are known as one of the most effective Planning Commissions in Mississippi, the rapid transition of DeSoto County from a rural agricultural backwater to an urbanized section of the Memphis Metropolitan Area has made their planning task extremely difficult. As a result, they appear most active in coordinating development and services as the need arises, rather than in planning for development and services for the future. At the present time, they are using a 1968 Comprehensive Land Use Plan for DeSoto County to guide them in their daily zoning decisions and to assist them in making future population and land use projections available to others responsible for providing services.

As in many formerly rural counties which are now experiencing growth for the first time, the governing body in DeSoto County (the Board of Supervisors) views new industrial and residential development as a positive trend which should be encouraged. The Planning Commission, reflecting this attitude, works closely with developers in obtaining the desired zoning and supporting services which will enable them to carry out their development plans. In the past, the provision of essential secondary services to support development, primarily utilities and schools, has been made possible by close cooperation between the developers and the county. The developers have paid special assessments for the provision of services (an established fee for each lot developed) and the county has then made every effort to provide the service as quickly as possible.

When questioned on the possible adverse secondary impacts of the projected rapid development, the planning staff expressed concerns over the financing of future public services, such as utilities, roads, schools, police, etc., given the low tax structure. But they did not appear to have considered any of the non-financial negative consequences of development, such as inadequate park and recreation space, traffic congestion, air pollution, energy consumption, etc. Since the county is still very largely undeveloped, this is an understandable attidue, but it may lead to unexpected problems if the pace of development in the northern portions of the county continues at its recent rate.

Two other regional planning agencies include DeSoto County within their planning area. The North Delta Planning and Development District is the state A-95 agency for DeSoto and other northern Mississippi Counties. They are not, however, active in land use planning in DeSoto County at this time and routinely approve grant requests supported by the Planning Commission. In addition, the Mississippi-Arkansas-Tennessee Council of Governments (MATCOG) is also an A-95 agency with respect to DeSoto County. MATCOG has planning responsibility for the entire Memphis Metropolitan area, and is beginning to work closely with the DeSoto County Planning Commission on regional land use issues. This agency views its role as one of coordination with the existing agencies, not of control. Still, to the extent that regional planning will be required to secure federal support for local programs, one may anticipate that MATCOG could have a tremendous influence over plans made in each county within its planning area. It is too soon, however, to evaluate the role which MATCOG may eventually assume vis a vis land use planning in DeSoto County, as this is a relatively new area of concern.

In general, land use controls in DeSoto County are developer-oriented. As mentioned, zoning requests are generally approved, unless the development would interfere with established uses. Since there is a great deal of vacant developable land and development is desired, this rarely creates any difficulties. Though the developers must conform to strictly enforced building and development codes, there is general agreement that these codes are standard requirements which simply protect against the irresponsible developer. In only one respect are developers constrained: the septic tank and package plant regulations do result in the requirement that development take place only in areas which are, or will be, sewered.

2.3 Population and Land Use Projections for the Southaven Interceptor Projects

Though population and land use data from both the DeSoto County Planning Commission and MATCOG were used in the preparation of the interceptor sewer plans, the consulting engineer on this project assumed primary responsibility for updating this data and formulating the ultimate projections used. Neither the Planning Commission nor MATCOG was involved in the planning of the sewer, beyond reviewing the plans as made by the engineer.

The consulting engineer, who also has a planning degree, is the consultant for all water, sewer and fire protection services planning for the District. The interceptors examined in this study are simply one component of an overall utilities improvement plan now being developed by the SUD. To support the comprehensive utilities improvement plan, an HUD grant was secured, which enabled the consulting engineer to do a detailed study of population and land use in the area.

After assessing population data from a variety of sources, the engineer derived his population projections for the entire SUD by accepting MATCOG's estimates of the spill-over growth from Memphis into DeSoto County, assuming 90% of this growth would occur in the SUD. (In the past, 95% of the county growth has been in Southaven, though developments planned outside Southaven are expected to assume a greater proportion of the growth than they have in past years.) He projected a 28,400 population for Southaven by 1980 and 40,800 by 1985.

In terms of projecting land use--and population densities--within segments of the SUD, the engineer experienced greater difficulty. He constructed a land use map based on existing zoning, past patterns of development, current development plans and land ownership and such influencing factors as transportation arteries and geographical obstacles to development. He did indicate in his study, however, that his land use and population projections were useful only to the extent that the Planning Commission followed this plan in making its zoning decisions. He therefore recommended close cooperation between the District staff and the Planning Commission in the future, a coordination that has been lacking in the past.

Though the consulting engineer's report does detail the impact of future land use and population projections on the demand of utility services, his study explicitly states that the provision of other services and the overall desirability of the projected land uses has not been considered. He was concerned only with the task of the Utility District in meeting projected needs, not with the possible role of the Utility District in encouraging or controlling patterns of growth. Both the consulting engineer and the engineer employed by the SUD on a regular basis recognized that these issues might be worthy of consideration, but they felt this was the role of the County Planning Commission.

3.0 The Land Use Impact Evaluation Process

3.1 Governmental Review

The first line of review for any local sewer project would be the review undertaken by the local land use planning agency, in this case the DeSoto County Planning Commission. From discussions with both Commission staff and engineers from the SUD, it does not appear, however, that the Planning Commission carefully reviews any of the sewer plans, including those interceptor plans now being funded by EPA. Since the SUD engineers do not view their role as one of assessing the adverse secondary land use impacts that current development trend in the county might create, but view this as a county planning function, there was no impact evaluation of the interceptor projects performed at the local county level.

This is not to say that the Planning Commission is not aware of the sewer plans which are being implemented. Coordination between the Commission and the SUD is established by a pattern of sequential approval of specific development plans proposed by private developers. The developers must present their plans to the Commission; then the Commission requires that the developer obtain approval of his plan from the county attorneys, the School Board, and the Utility District. However, since development is viewed as very desirable, this process of approval of plans does not include consideration to the long-range secondary impacts of the specific developments on the Southaven area. The agencies are there to provide services, and their review of the plans is oriented to anticipating service needs, not to evaluating the desirability or porblems inherent in the development.

The lack of consideration given to the land use implications of the sewer projects at the county level was carried forward in other levels of governmental review. Both the North Delta Planning and Development District and MATCOG accepted the population and land use projections without study, and approved the grant request. The state water quality agency and EPA also accepted the statistics proposed by the engineers, since they were consistent with population and land use projections which had been prepared over the years by the local planning agencies. A negative environmental impact assessment was also accepted, and a negative declaration made by the regional staff. This assessment, like others prepared for all EPA projects, made no mention of adverse secondary impacts.

3.2 Non-Governmental Review

As mentioned previously, the developers in the area are the stimulus for utility planning, and the plans are tailored to the needs of specific developers. These developers are very satisfied with the coordination between themselves and the planning and utility agencies, and the agencies believed the developers to be responsive to their requirements and reasonable in the demands they make for services. Thus, developers have always supported the improvement programs of the SUD, including the two interceptors planned for West Southaven and West Greenbrook.

A public hearing on these two interceptors was held in August, 1973. No opposition was voiced, and support was given. The individuals attending were primarily those responsible for ensuring public servcies in the county (state legislators, SUD staff, MATCOG) and individuals concerned with the development of the Freeport Industrial Park (to be served by the West Southaven interceptor). The major subjects of this hearing were a discussion of the timing of the connection of the interceptors to the larger Horn Lake Creek interceptor and a discussion of the costs of the project. No mention was made of the size of projected population figures, the potential secondary service problems or negative impacts, or the routing or sizing of the interceptors.

4.0 The Influence of the Impact Evaluation

As discussed in the preceding section, the two interceptors studied, and the larger SUD improvement plan, have never been questioned in terms of potential adverse secondary impacts on land use or energy consumption. Rather, they are specifically designed to encourage development within the service area of the SUD. The type of development which has occurred in the past-- low to moderate priced residential-- is expected to continue and there are hopes of a balancing of the predominantly residential character of the area with commercial and industrial use. It does not appear that strict land use controls will be imposed; but to the contrary, developers will be offered support, and services will be provided as quickly as possible.

Though an outside observer can be critical of the current planning process-- the lack of land use control, the lack of plans to finance the urban services that will be necessary if the area develops as anticipated, the lack of concern for over-development and its attendant problems of congestion -- the situation in Southaven is perfectly understandable. For years, the county experienced the slow but steady decline in population typical of rural areas and the established government structure was appropriate for this type of area. Though it is no longer appropriate as the county urbanizes, it would be difficult for the county to change its attitudes and policies with respect to land use, for its current low taxes and support to developers is precisely what has attracted developers to the area. In many respects, the county agencies have done an admirable job simply in keeping up with the provision of services to new development.

5.0 Other Project Attributes Influencing Land Use

5.1 Project Staging

The interceptors financed by this EPA grant are only the highest priority sewer lines in the first phase of a two-phase program to provide sewer service for a fully developed Southaven area (including the 5,000 acres now within the SUD, and an additional 5,500 expected to be added by 1985). These two projects received highest priority because of current development plans. The West Southaven line will serve the industrial park, the West Greenbrook line a planned residential subdivision.

Because of the strict septic tank and package plant regulations, and staging of interceptor construction has a direct effect on development. At this time, however, the plans for development dictate the priority given to specific interceptors within the overall improvement program of the SUD.

However, this situation may change. In the past, the SUD has been permitted to stage the construction of new interceptors and treatment facilities to meet developers' needs. However, with the completion of Phase I of the Horn Lake Creek Interceptor, the Utility District will not be able to treat its own wastes--it must connect all sewerage facilities to the HLC interceptor for treatment at the Memphis STP. Unless an area lies within the reach of the HLC interceptor or a connecting line is built, the SUD will be unable to construct sewerage facilities. In effect, the staging of sewerage facilities in the SUD will become dependent on the routing and timing decisions made by the HLC Interceptor Sewer District.

5.2 Project Financing

This EPA project is receiving 75% federal financing. The 25% local share has been obtained by a 12½% no-interest loan from the state and an additional 12½% loan from the FHA. (At this time, the SUD cannot float additional revenue bonds, and thus the FHA loan was critical.)

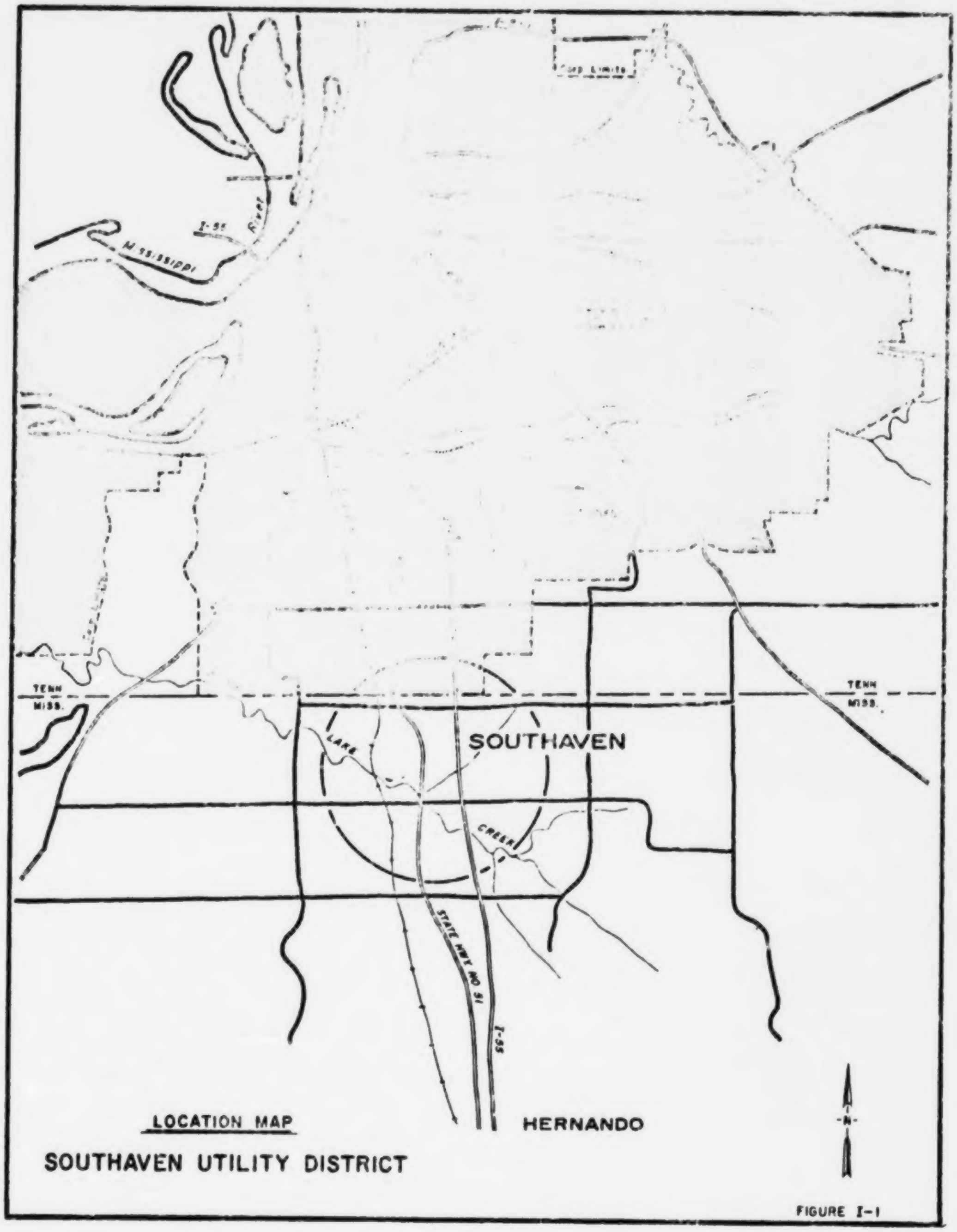
Though the SUD anticipates that rapid industrial and residential development in this area will result in the collection of tap fees and monthly user charges from the direct users of these two new interceptors to pay for the debt repayment and operating costs, it projected that it would take five to seven years of new development to produce sufficient revenue from the immediate service area to pay the total annual cost. Rather than absorbing a portion of the annual cost during these years--thus forcing existing users to pay for new development--it initially planned to secure agreements from developers controlling la d in the service areas to underwrite the annual operating costs. This was the system described in the first engineering studies. At present, however, they intend to assess developers a pro-rata share of these costs at the time they apply to connect their collection systems to the interceptor lines. Either method used will result in an equitable distribution of the costs between developers and existing residents and establishments.

5.3 Regionalization

As mentioned previously, the SUD will cease sewage treatment once the Horn Lake Creek interceptor is constructed. At the time when the SUD interceptor lines are connected to the HLC interceptor, the SUD will begin paying the Horn Lake Creek Interceptor Sewer District a fee for transport and treatment of collected wastes based on flow rates. Since the Horn Lake Creek interceptor is being sized for full development of the Horn Lake Creek River Basin, including high denstiy development in the Southaven area, the Utility District should be able to construct and connect interceptors in the future without any concern over the capacity of the transport and treatment system. Though the staging of the HLC interceptor may delay construction of new SUD interceptor lines in the eastern portion of Southaven's ultimate Utility District boundaries, the end result of the regionalization now underway will be to make it easier for the SUD to open new areas for development, since only relatively short interceptor lines need be constructed. (See the Horn Lake Creek Interceptor Sewer District case study for more detail on this project.)

APPENDIX

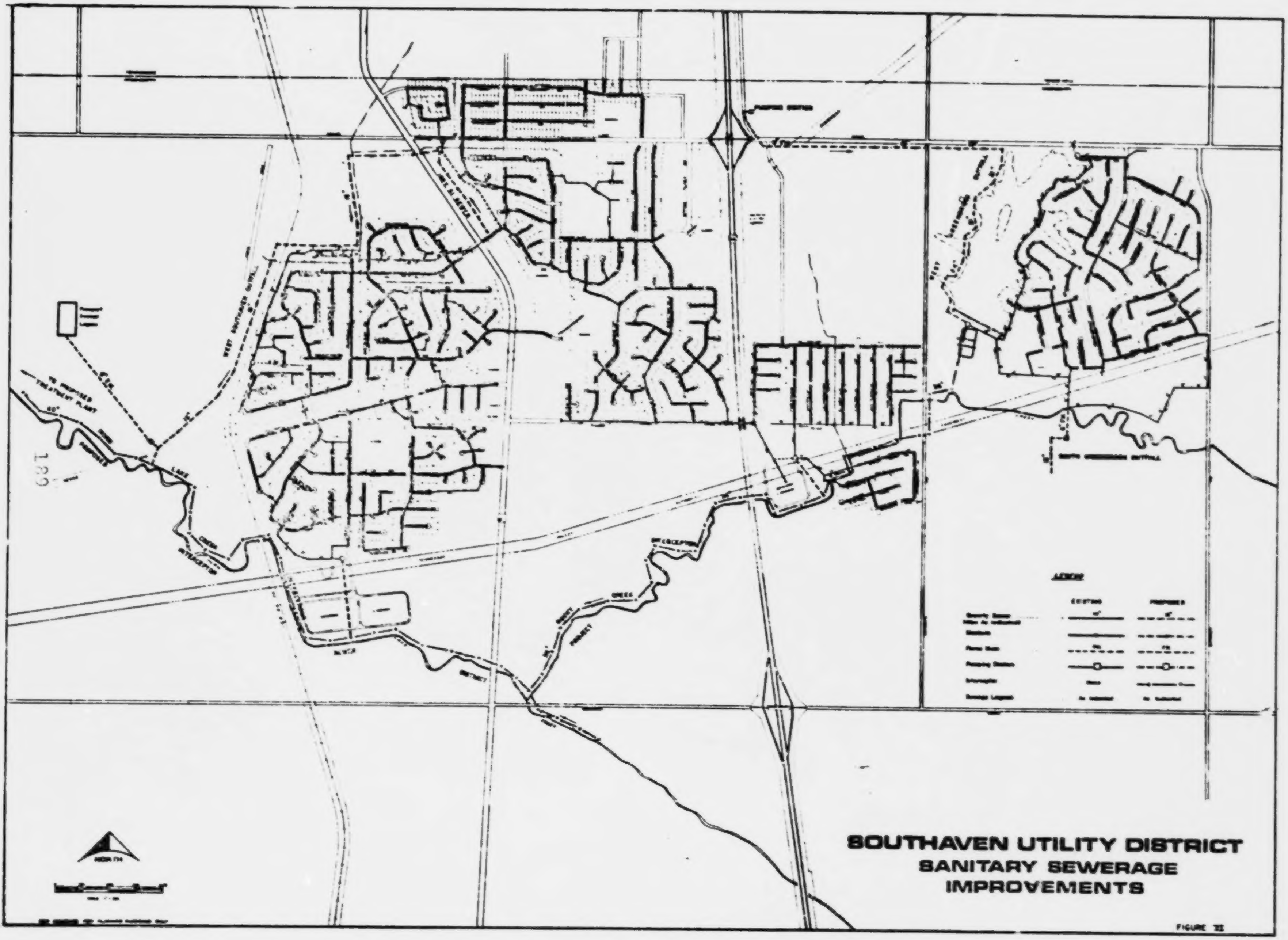
SOUTHAVEN UTILITY DISTRICT INTERCEPTORS


City Limits
I-55
Mississippi
TENN
MISS.
TENN
MISS.
SOUTHAVEN
LAKE
CREEK
STATE HWY NO 51
I-55
HERNANDO
N

LOCATION MAP

SOUTHAVEN UTILITY DISTRICT

FIGURE I-1


LEGEND
EXISTING
PROPOSED
Pumping Station
NORTH

SOUTHAVEN UTILITY DISTRICT
SANITARY SEWERAGE
IMPROVEMENTS

FIGURE 22

SOUTHAVEN UTILITY DISTRICT INTERCEPTOR DATA

	West Southaven	West Greenbrook
Length (miles)	1.8 gravity .4 force main	1.3 gravity .6 force main
Terminal diameter	24 inches	24 inches
Cost	$ 512,000	$ 428,000.
Initial Flow	.3 MGD *	(unclear)
Design Flow	2.6 MGD *	1.9 MGD *
% Residential Flow at Design Year	12%	100%
Capacity Flow	(same as for the design year--1985)	

This data was difficult to obtain, and the figures represent engineer's estimates combined with land use and population projections.

SOUTHAVEN UTILITY DISTRICT INTERCEPTOR COSTS AND FINANCING

Total Cost of Interceptor Project:		$ 1,267,700.
EPA Eligible Cost of Project:		$ 1,222,250.
Contributions to Total Cost:		
	Federal	$ 916,880.
	State Loan	$ 152,781.
	FHA Loan	$ 198,231.
Construction Costs of Interceptors:		
	West Southaven	$ 512,000.
	West Greenbrook	$ 428,000. plus
		$ 38,000 not EPA eligible.

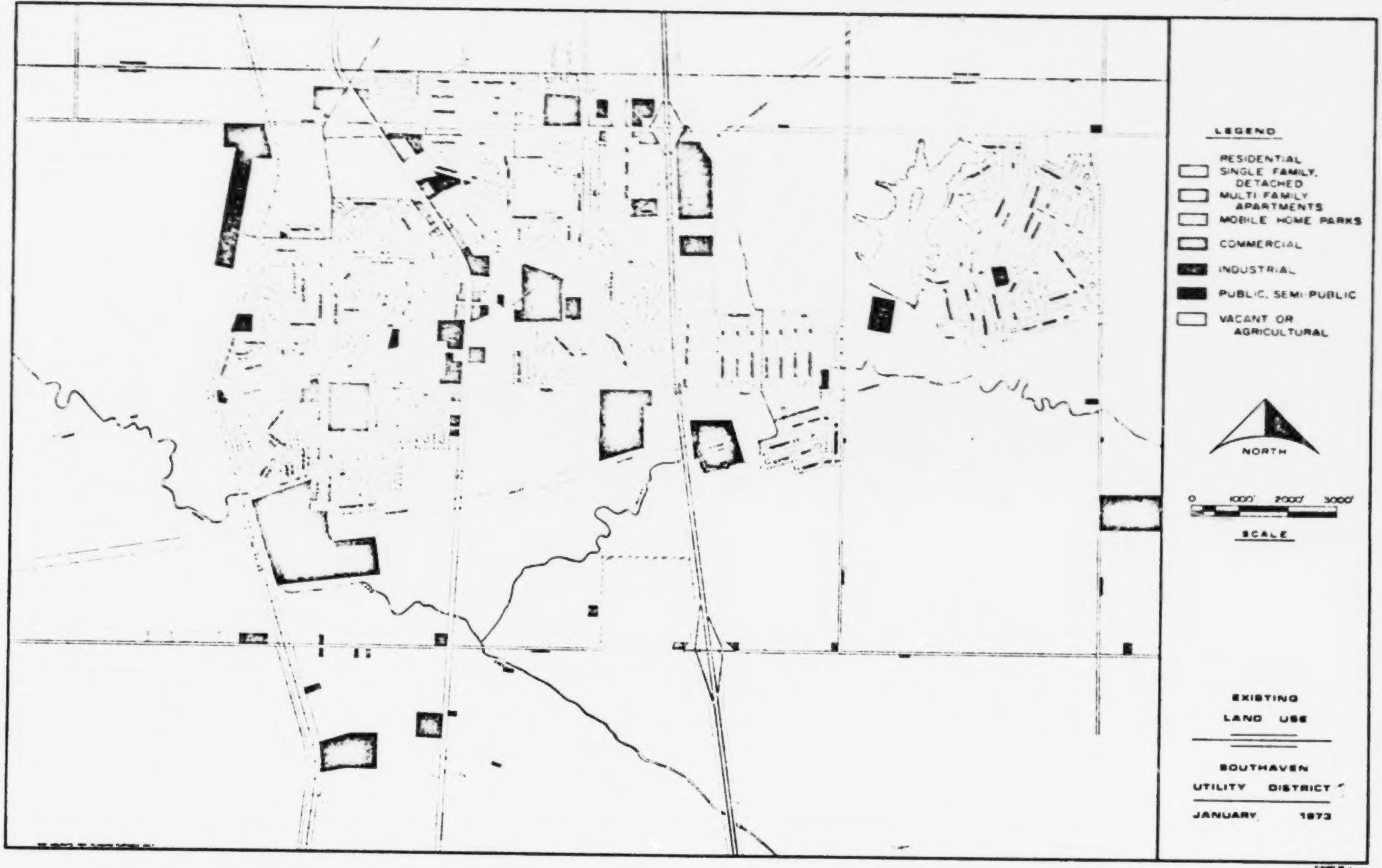
The project will be financed by a no interest state loan and a low interest FHA loan. Developers will ultimately pay the costs incurred which are not collected from tap fees and user charges imposed on residents and establishments which will use the interceptors; they will be assessed the pro-rata share of uncollected costs as they develop land in the service area.

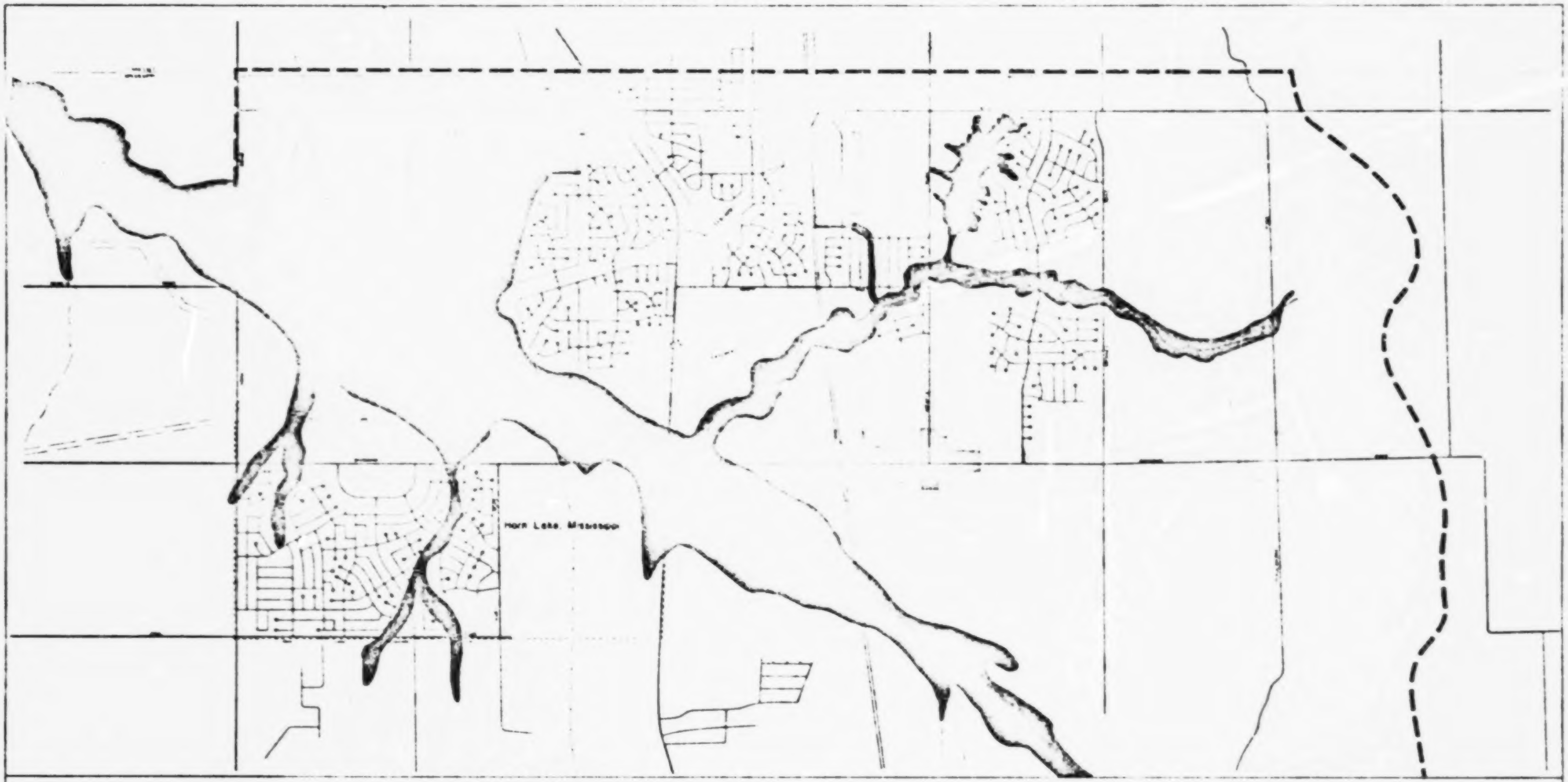
SOUTHAVEN-DESOTO COUNTY POPULATION FORECASTS
1970-1985

Source of Estimate	1970	1975	1980	1985
Bartholomew County Plan (1967)				
1. Total County				
a. High Estimate	35,200	42,000	50,000	60,000
b. Medium Estimate	34,000	39,800	46,500	54,100
c. Low Estimate	32,400	36,500	41,100	46,200
2. Total County Less Hernando & Olive Branch				
a. High Estimate	32,020	38,320	45,870	55,370
b. Medium Estimate	30,820	36,120	42,270	49,370
c. Low Estimate	29,220	32,820	36,870	41,470
3. Southaven				
a. High Estimate	10,900	18,300	25,700	33,100
b. Low Estimate	9,300	13,900	18,600	23,200
MATCOG Report (1972)				
1. Total County	35,885	44,869	58,309	74,822
2. Hernando	2,499	2,860	3,295	3,770
3. Olive Branch	1,513	2,055	2,750	3,300
4. Remainder of County	31,873	39,954	52,264	67,752
Stepdown Correlation From MATCOG Report				
1. Unincorporated Area	31,873	39,954	52,264	67,752
2. Southaven Area *	10,000	17,921	28,384	40,774
3. Other Area	21,870	22,033	23,880	26,970

---

* Based upon Southaven Area Receiving 90% of Growth Between 1970-1975; 85% between 1975-1980; and 80% between 1980-1985.

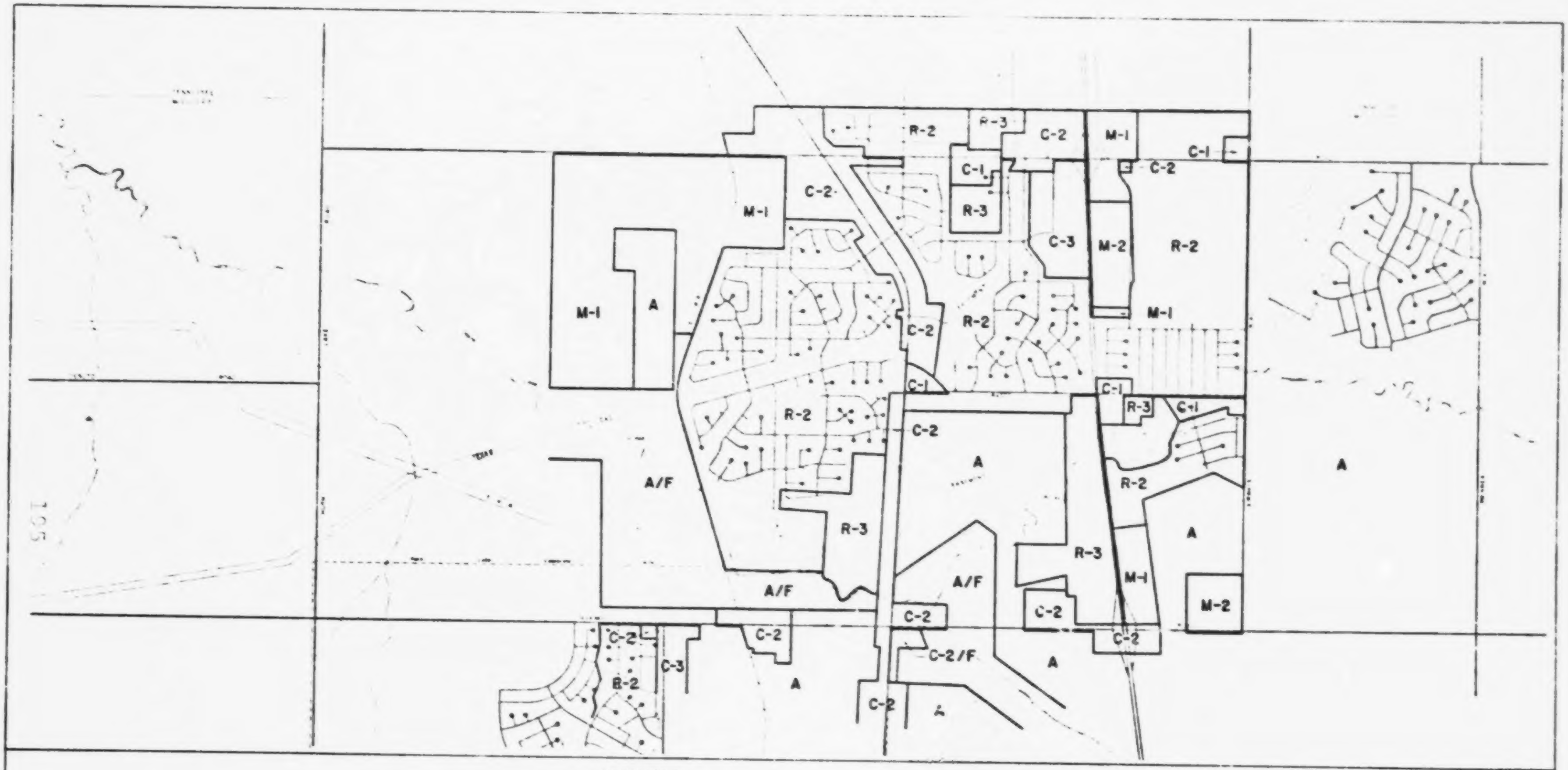

LEGEND
RESIDENTIAL
SINGLE FAMILY, DETACHED
MULTI FAMILY APARTMENTS
MOBILE HOME PARKS
COMMERCIAL
INDUSTRIAL
PUBLIC, SEMI-PUBLIC
VACANT OR AGRICULTURAL
NORTH
0
1000'
2000'
3000'
SCALE
EXISTING
LAND USE
SOUTHAVEN
UTILITY DISTRICT
JANUARY 1973



SOUTHAVEN UTILITY DISTRICT
LAND USE PLAN

LEGEND

- - - - UTILITY DISTRICT BOUNDARY
▭ MEDIUM DENSITY RESIDENTIAL (10-20 People/Ac.)
▭ HIGH DENSITY RESIDENTIAL (20-50 People/Ac.)
▭ COMMERCIAL
▭ INDUSTRIAL
▨ FLOOD PLAIN & CONSERVATION AREA


R-2
R-3
C-2
M-1
C-1
C-2
C-2·
M-1
C-1
R-3
C-3
M-2
R-2
M-1
A
C-2
R-2
M-1
C-1
C-1
R-3
C-1
R-2
C-2
A
A/F
R-2
R-3
A
R-2
R-3
A
M-1
A/F
A/F
C-2
C-2
M-2
C-2
C-2
C-2
C-3
B-2
C-2
A
C-2/F
A
C-2
A

DISTRICTS

A AGRICULTURAL
R-1 SINGLE FAMILY RESIDENTIAL
R-2 SINGLE FAMILY RESIDENTIAL
R-3 MULTIPLE FAMILY RESIDENTIAL
PRC PLANNED RESIDENTIAL
C-1 NEIGHBORHOOD COMMERCIAL
C-2 HIGHWAY COMMERCIAL

C-3 GENERAL COMMERCIAL
C-4 PLANNED COMMERCIAL
M-1 LIGHT INDUSTRIAL
M-2 HEAVY INDUSTRIAL
M-3 PLANNED INDUSTRIAL
F FLOOD CONTROL

SOUTHAVEN UTILITY DISTRICT
EXISTING ZONING
JUNE, 1973

THE PREPARATION OF THIS MAP WAS FINANCED IN PART THROUGH A COMPREHENSIVE PLANNING GRANT FROM THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT UNDER THE PROVISIONS OF SECTION 701 OF THE HOUSING ACT OF 1954, AS AMENDED

Diversified Consultants, Inc.

COMPARISON OF
EXISTING LAND USE QUANTITIES

Urban Land Use Categories	Acres per 100 People	
	Southaven Utility District	Average from Select Miss. Communities*
Residential	6.71	7.74
Commercial	.62	.95
Industrial	.32	.96
Public, Semi-public	1.68	2.51
R. O. W.	3.46	4.61
TOTAL	12.79	16.77

* Canton, Indianola, Long Beach, Oxford, Corinth

EXISTING HOUSING INVENTORY

Type of Structure	No. of Structures	No. of Dwelling Units
Single-family, Conventional Detached	3,510	3,510
Mobile Homes	52	52
Two-family	15	30
Multi-family	5	32
TOTAL	3,582	3,624

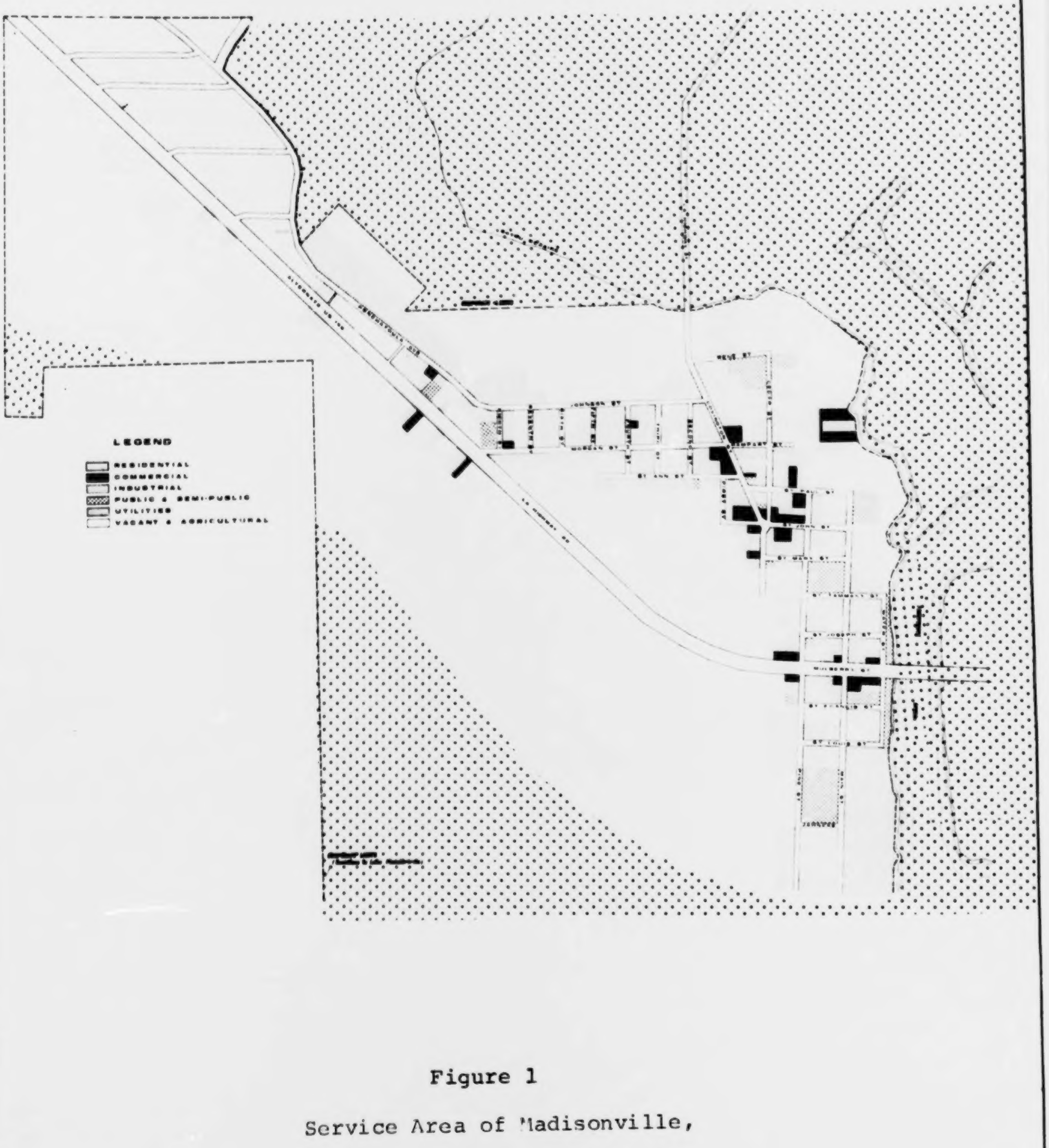
Madisonville, Louisiana

1.0 Introduction

1.1 Project Description

Madisonville is a small, predominantly rural, town. It is part of St. Tammany Parish and borders the Tchefuncte River and the north shore of Lake Pontchartrain. A four lane causeway connects Madisonville with New Orleans; it is only a 45 minute drive to the city. Development of the area is expected to increase in the years ahead, as Interstate 12 is completed just north of town. The area is pristine, with beautiful forests and an easily accessible lakefront area. Several new subdivisions are being planned, or are in construction, but most of them, at present, are outside the corporate limits of Madisonville.

Madisonville is installing a new sewer collection system and treatment plant to replace ineffective septic tanks. About 40,070 feet of gravity line is being laid, and some short sections of force main will be incorporated in the layout where topography requires uphill flow. Approximately 30% of the line work could be considered interceptor, but it is difficult to disaggregate interceptor from collection lines in a system of this sort. The lines will range from 8" to 12" in diameter; the total cost of the project is $763,000, with $345,000 of that going for the line work. The population projections for the project area cannot be considered reliable predictions, but they anticipate a growth in population from the present 800 or so to 2,500 within forty years.



LEGEND
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC & SEMI-PUBLIC
UTILITIES
VACANT & AGRICULTURAL
JOHNSON ST
ST. ANN ST
ST. PAUL ST
ST. JOHN ST
ST. MARY ST
ST. JOSEPH ST
MULBERRY ST

Figure 1

Service Area of Madisonville, Louisiana, Sewer District #1.

1.2 Project History

This project, also, was begun under PL-660 and financed by a Step 2/3 Grant under PL-92-500. The firm of Simmons J. Barry, Consulting Engineers, Baton Rouge, began in 1971 to plan a sewer system for the whole town, which had none at that time. The firm had previously been the chief advisor on all the town's engineering projects. In April 1972 they published an "Interim Basin Plan", outlining the present project. The Grant was approved in 1973, and the bidding documents issued in July of 1974. Since initial bids were improperly submitted by some contractors, the contracts will be bid again, with a bid opening scheduled for July 29, 1974. Construction should take about eighteen months from beginning of construction.

No design changes were made in the course of project planning and approval. Although there is excess capacity in the system, is comparatively small. The pipes tend toward the minimum size which can be installed. Even considering the economies of scale which are possible in sewer pipe installation, it is considered unnecessary to handle flows greater than .375 MGD.

1.3 Project Purpose

The primary purpose of the project is pollution control. Madisonville is the major pollutor of the Tchefuncte River, with runoff from inadequate septic tanks and flow from the shipbuilding industry areas. Sewage is found standing in ditches in some parts of the town. In order to develop the lakefront as a recreational area, it is mandatory to clean up these problems. Growth in the project area is expected, but less growth will occur within the city limits of Madisonville Planning area. Development external to the town will not connect to the Madisonville system, but will provide its own treatment. The Regional EPA planners considered that this project had no real purpose other than pollution control and that little long-range planning of the town had been done.

2.0 Land Use Planning

2.1 Population Projection

The population projections on which the .375 MGD plant was designed were developed by the engineering firm Simmons J. Barry and Associates, which has been a consultant to the town for the last fifteen years. A straight line projection using 1950, 1960, and 1970 population figures was made, and a percentage growth added. This percent growth factor is obviously of great significance in the light of the figures below.

St. Tammany Parish Population

	1950	1960	1970	1973
Parish	26,988	38,643	63,585	
Ward #1	1,903	1,847	2,929	
Madisonville	915	860	801	798

Ward #1 is that section of the parish which includes Madisonville; other parts of the ward are experiencing growth.

Madisonville Population 1950 - 1970

	1950	1960	1970
Population	915	860	801
% Change Previous Decade	-5.9	-6.0	-6.9
% of Parish	3.2	2.2	1.3

Madisonville, then, has been steadily declining in population over the past thirty-five years. Because of transportation developments, it appears that this decline will be reversed, but the engineer's projection of a population increase to 2,500 people within forty years was submitted without substantial justification.

A land use study compiled by the Urban Studies Institute of the Louisiana State Universtiy (LSU) maintains that population projection on the north side of Lake Pontchartrain is very inexact. "The projection of small area population is fraught with severe difficulties. Any significant change in socioeconomic phenomena, such as the location of a major new employer or subdivision in the area, is likely to invalidate predictions based on past trends and assumptions about the future."[1] This report was published after planning for the Madisonville sewer project was designed. The LSU study of population trends is more elaborate. They, too, expect an increase in population in Madisonville, but not as great as 2,500 people.

The Urban Studies Institute sees migration as the primary factor in Madisonville's growth. They feel migration into Ward #1 will be high until 1990, due to a number of circumstances:

(a) The availability of the recently expanded Lake Pontchartrain Causeway and Interstate 12 for commuting into Slidell, Hammond, and New Orleans.

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[1] Comprehensive Plan, Madisonville, Louisiana; Urban Studies Institute, Louisiana State University, June 1, 1973, p. 87.

(b) Preference of middle and upper income persons for a semi-rural environment offering large building lots, outdoor recreation, and beauty.

(c) The desire of city dwellers to escape the socio-economic problems of the central city.

(d) The continuing decentralization of manufacturing, commercial, and office activities out of the central city.

St. Tammany Parish is expected to reach a population of 128,500 by 1990, a 100% increase over the 1970 population and a considerably greater proportion of growth than the New Orleans SMSA is expected to receive, which is only 33.6%. These growth rates were obtained by combining the natural rate of increase, 11.4 persons per thousand at present, with a 21% rate of migration. The natural rate of increase was presumed to hold steady, "since demographic opinion is currently divided between those who predict a rise in net natural increase by 1990 and those who predict a decline."[2]

Madisonville, itself, is not expected to share an equal rate of growth.

Madisonville

	1980	1980	1990
Population	801	950	1,100
% change over last decade	-6.9	+18.6	+15.8

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[2] Comprehensive Plan, p. 88.

The engineer now feels that the original growth rate of ten new sewer connections per year being added to the new system may be high, at least in the short term. The primary reason, he feels, is the money shortage and its effect on housing starts.

2.2 Land Use Projections

Current land use in the Madisonville city limits is concentrated in the center of town, above the approximately 1,000 acres of marshland near the lake. Future residential development will occur in land which is currently zoned agricultural.

Madisonville Land Use (Present)

	Acres	Percent
Residential	72	4.95
Commercial	6	.41
Industrial	19	1.03
Public/Semi-Public	10	.69
Right-of-Way	71	4.88
Agricultural	296	20.3
Marsh	1,000	68.7

Madisonville will not develop as fast as the rest of the Parish for several reasons.

(a) Compared with the rest of the Ward #1 there is little developable land in the town.

(b) Numerous small land holdings within the town make assemblage of land for large tract development unlikely.

(c) The construction of I-12 and the drawbridge on Route 22 make development more likely near I-12 interchanges and east of the Causeway than in town.

(d) 1960-1970 trends revealed that in in-migrants prefer to locate near but outside of existing small communities.

Thus, the provision of sewers, though it may be a primary stimulant to growth where growth has had little incentive for years, will not overcome completely several factors which mitigate against development in this particular area. On the other hand, it might be noted that the withholding of money for sewer construction might absolutely halt development in the town.

The industrial economy of Madisonville is dependent on shipbuilding. The construction facilities for building barges have been expanded because of new contracts recently received, but the industry is cyclical and cannot be expected to provide an expanding, or even a steady, employment base for the community. The industry will not contribute significant flow to the sewerage system; its only waste will be from the sanitary facilities used by the employees.

Madisonville may expand its boundaries slightly and annex some adjacent territory. That is not planned at present, but is a possibility, according to the mayor. Twenty-five percent of the town must approve such an expansion. Its primary purpose would be to provide sewer facilities for those outside the city limits who cannot get FHA financing without provision of public sewers. It might, therefore, be in the interest of developers to have their subdivisions annexed, for though they would have to pay for the expense of laying sewer lines anyway, the economies of scale obtainable by connecting to the municipal treatment plant are such that they may produce a substantial saving over the use of package plants.

Forestry is a major land use in the area, but it is not present in Madisonville. Some owners have sold large tracts of woodland to developers, especially on the opposite side of the Tchefuncte River from Madisonville. The Interim Land Use Plan for St. Tammany Parish shows all of the Madisonville area developed for low density residential use. The timber industry will be displaced from the vicinity of Madisonville and the neighboring communities of Covington and Abita Springs.

2.3 Current Trends in Population and Land Use

Madisonville is the last community to share in the residential growth of the north shore, for reasons already mentioned. It is an older town, with an older population than the rest of the SMSA. Whereas the employment in neighboring Tchefuncte Estates is 97% white collar, only 30% of Madisonville's employment is white collar.

In the neighboring areas, heavy speculation in land is present. This is not true in Madisonville. No planning commission has legal jurisdiction in this area to regulate land use, and forests are being cut down on a large scale to construct relatively expensive homes for executives commuting to New Orleans. Boat slips are being cut in the shoreline, and marinas constructed for pleasure craft owned by the residents. Yet this type of expensive development is not happening in Madisonville itself.

2.4 Land Use Controls

Madisonville has evidently had little need for land use controls. About ten years ago, a small subdivision of less than 200 units was begun; the land was already zoned for residential use, but there was no sewerage available. It is partly to enable this development to take place that the present project was begun. None of the lots has been built upon yet, as the sewer project has not entered the construction phase. Future development will require the rezoning of agricultural land, but this will be no obstacle if present policy continues.

3.0 Land Use Impact Evaluation Process

3.1 Governmental Review

The A-95 Clearinghouse, the Office for Intergovernmental Relations in Baton Rouge, received no unfavorable comments on Madisonville's plans. Since all the communities surrounding Madisonville - Tchefuncte Estates, Covington Country Club Estates, Riverwood Estates, and the town of Covington - have sewage collection systems and treatment plants, Madisonville is one of the last major polluters of the Tchefuncte River. A small stormwater drainage system was built in Madisonville in the 1930's, but it does not work adequately.

Clogged drains, weeds in ditches, broken culverts, and generally inadequate drain passages combine to produce conditions of stagnant water in large areas of the parish, producing a health hazard through the breeding of mosquitos. These points were noted in the Interim Basin Plan, and the project has gotten support from all participating government agencies.

3.2 Non-governmental Involvement

In soliciting comments from the residents on Madisonville's future for the development of the Comprehensive Plan, the researchers found that the residents perceived inadequate drainage as the town's most pressing problem. Provision of drainage was seen as a public health issue; growth which it might induce was a secondary issue.

Growth was felt to be an issue by development interests, on the other hand, and they pressed for the adoption of the sewage system proposal. Other communities surrounding Madisonville were growing rapidly, while Madisonville was lagging behind. The health issue continued to be of predominant importance, however, and development interests were only additional catalysts for the project.

4.0 Influence of the Impact Evaluation Process

The influence of the evaluation process has only been to hasten the adoption of the project. The EPA regional staff considered the project to be a pollution emergency, because so much raw sewage was running into the Tchefuncte River. While it was felt that the quality of planning in the project was not very high, this was no reason to delay approval. The project will involve a full collection system, serving mainly existing housing, so growth was not considered to be a difficult issue. The one small subdivision which will benefit from the project is less than 200 units, and it was felt that growth will not reach the projected population figures within the design period. Most officials, planners as well as EPA personnel, felt that design of projects for small towns should include system capacity for the ultimate population. To restrict funds to a project, to insist on an early design date and a limited capacity makes sense in large scale projects where growth may be rapid and steady, but in a small town with no prospect of major population growth, economies of scale are so large that it seems foolish to invite the expense of more than one construction project. Thus, although the planning for the Madisonville project did not take into account the possibility of annexations, or the drainage of marshland for housing (very unlikely anyway), its long term population of 2,500 persons, while perhaps too large, was accepted without debate.

5.0 Other Factors

5.1 Project Financing

The local share of the capital financing will come mainly through a front footage assessment. Each landowner whose property will be served will pay according to the length of his property fronting on the roadway served by the sewer network. $130,750 of the projected project cost will be raised this way, another $90,000 through general obligation bonds. Thus, the users of the system will be paying for it on an equitable basis. Since all land which will use the system fronts on the sewer lines, no one will avoid paying a fair share. The developer of the subdivision will pay an assessment for his lots although no houses are built on them. This cost will be passed on to future residents. Future expansion of the system will be paid for by those requesting it.

Operations expenses will be paid by a user charge, presently estimated to be $36 per connection per year. Current costs are running ahead of estimates, but EPA has agreed to amend the grant to the new amount. Latest bids are only $22,600 ahead of estimates, but the increase will be higher when new bids

APPENDIX

MADISONVILLE INTERCEPTOR

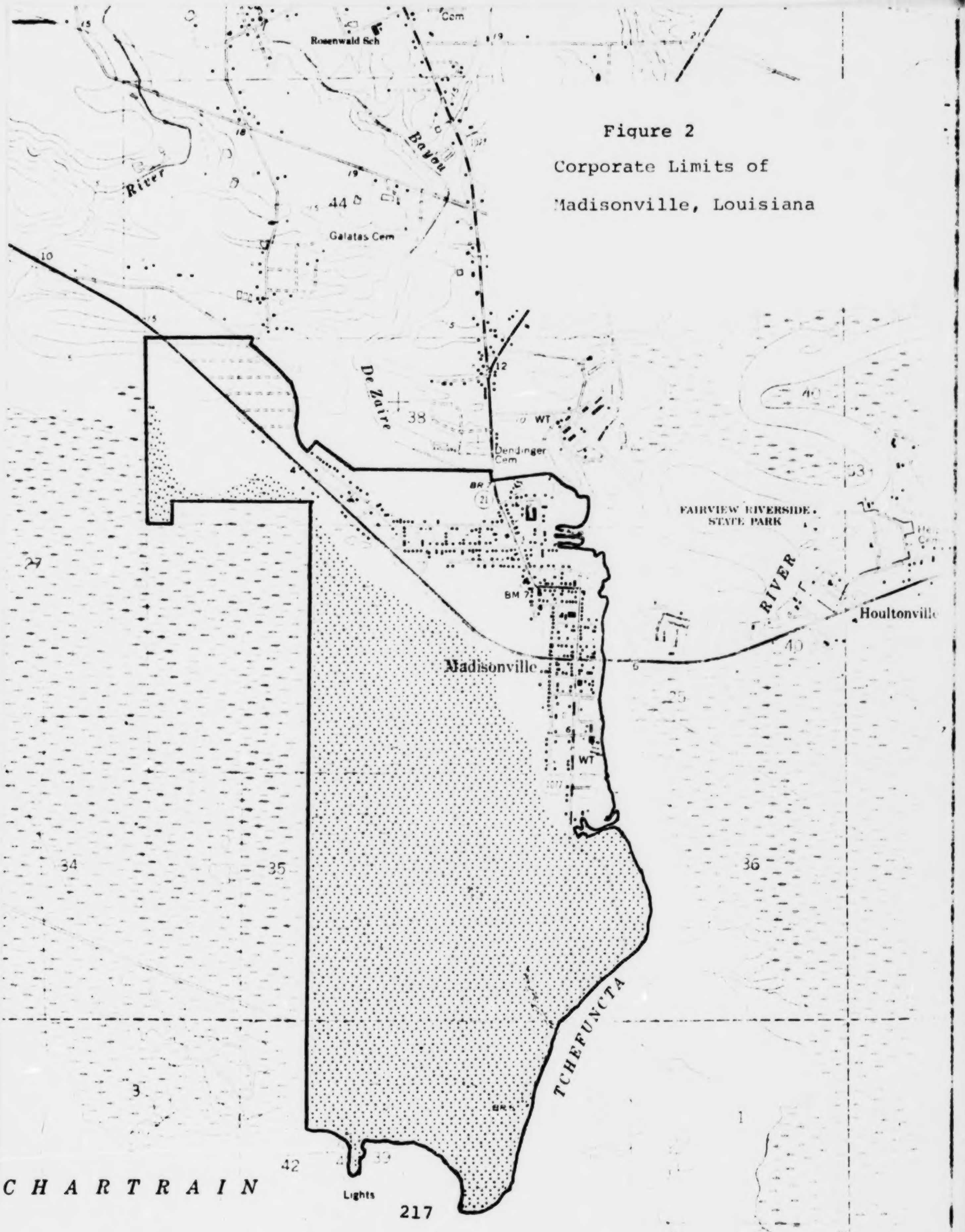

Rosenwald Sch
Cem
Bayou
River
44
Galatas Cem
De Zaire
38
Dendinger Cem
WT
BR
21
FAIRVIEW RIVERSIDE STATE PARK
RIVER
Houltonville
BM 7
Madisonville
25
27
34
35
36
TCHEFUNCTA
3
1
42
39
C H A R T R A I N
Lights
38

Figure 2

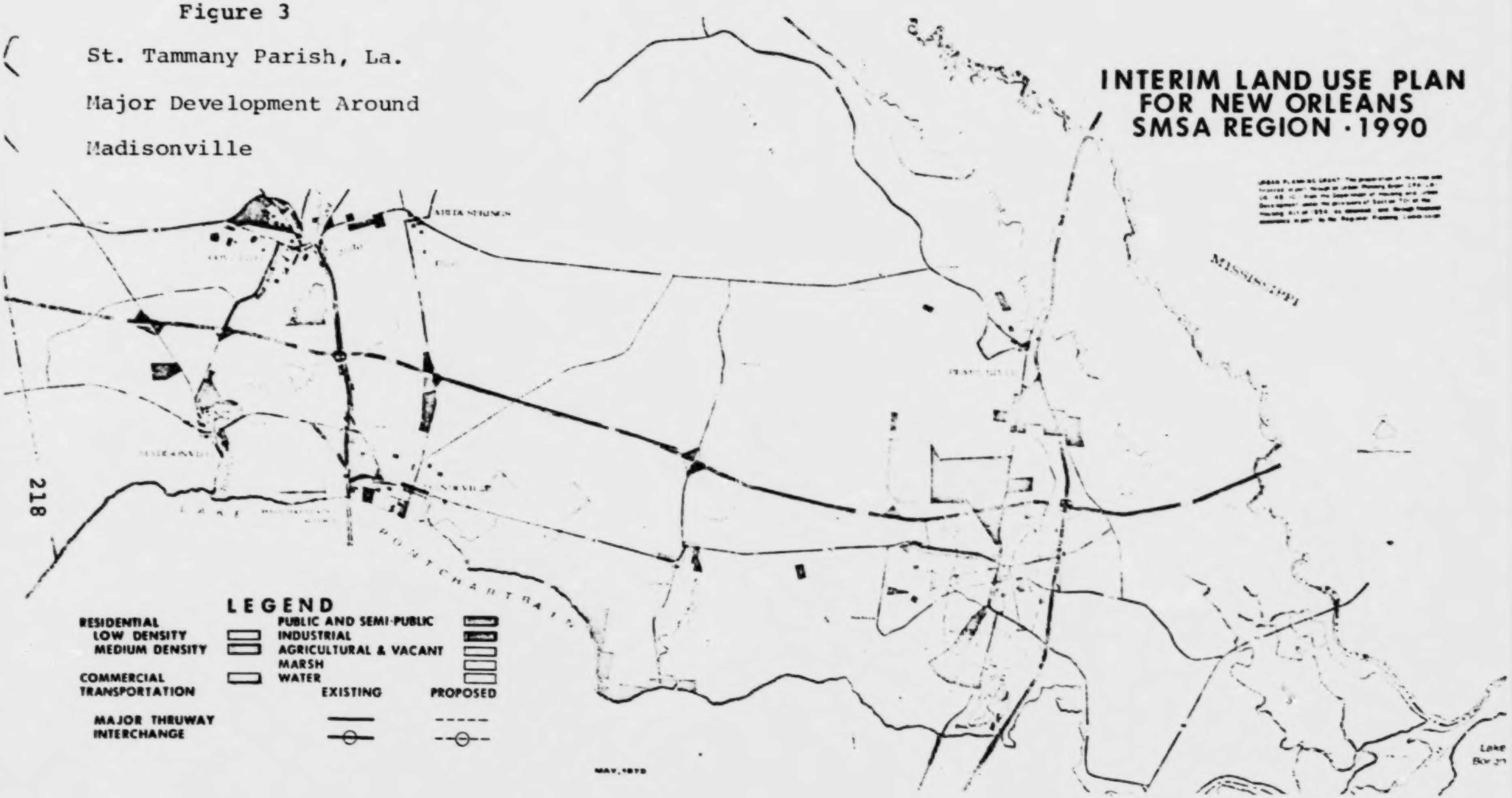
Corporate Limits of Madisonville, Louisiana

Figure 3

St. Tammany Parish, La.

Major Development Around

Madisonville


INTERIM LAND USE PLAN
FOR NEW ORLEANS
SMSA REGION · 1990
ABITA SPRINGS
MISSISSIPPI
LAKE PONTCHARTRAIN
Lake Borgne
LEGEND
RESIDENTIAL
LOW DENSITY
MEDIUM DENSITY
COMMERCIAL
TRANSPORTATION
PUBLIC AND SEMI-PUBLIC
INDUSTRIAL
AGRICULTURAL & VACANT
MARSH
WATER
EXISTING
PROPOSED
MAJOR THRUWAY
INTERCHANGE

MADISONVILLE

Appendix

Project Data

Length	40,670	8,000
Type	Gravity	Force Main
Area Served	- 450 -	
Diameter (inches)	8", 10", 12"	8"
Average Initial flow (year)	.1 MGD (1976)	
Average Design flow (year)	.25 MGD (2010)	
Average Ultimate flow	.25 (2010)	
Per capita use	100	
Cost	655,880.75*	

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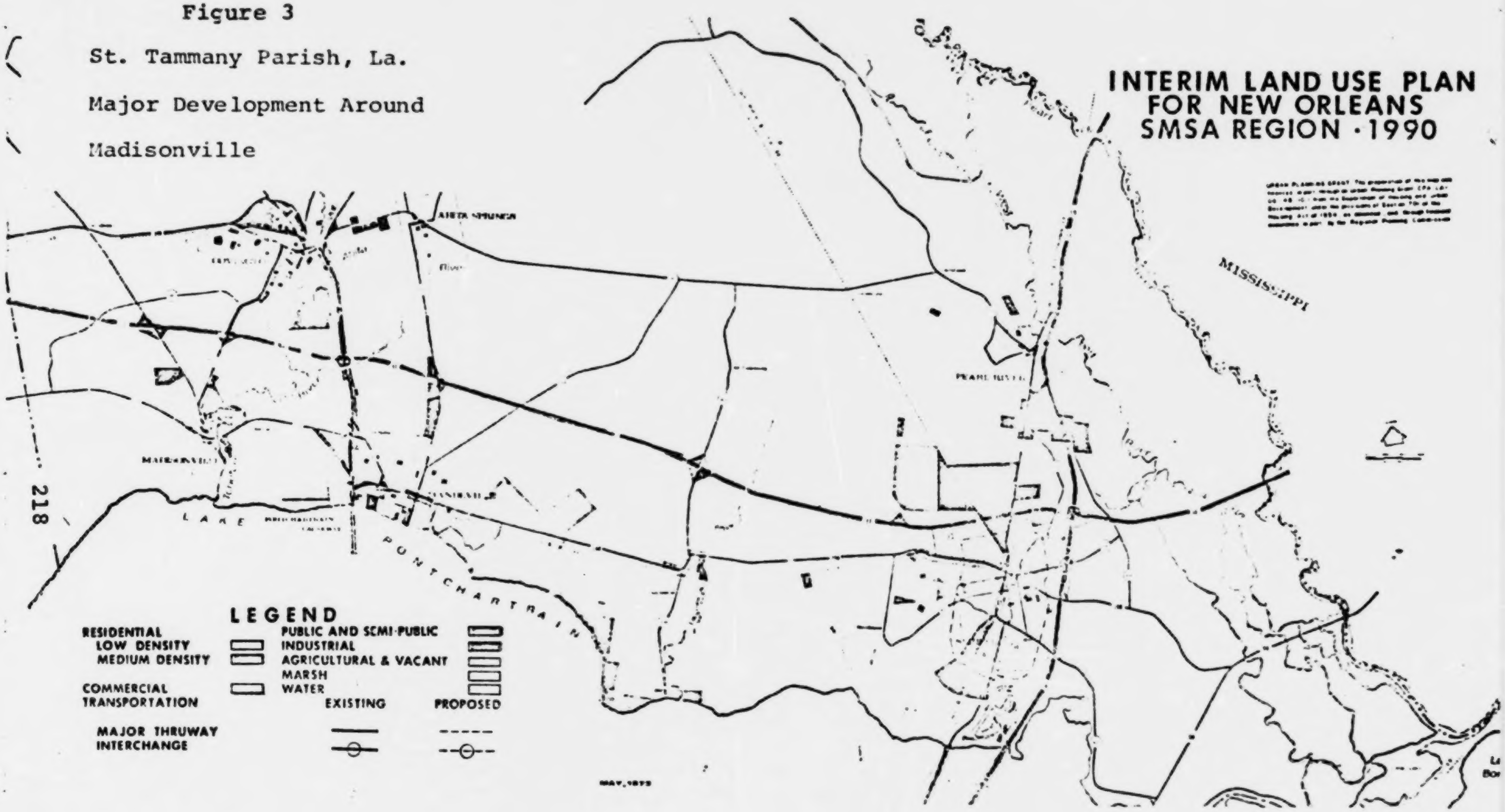
*Includes lift and pump stations (June 13, 1974)

Figure 3

St. Tammany Parish, La.

Major Development Around

Madisonville


INTERIM LAND USE PLAN
FOR NEW ORLEANS
SMSA REGION · 1990
MISSISSIPPI
ABITA SPRINGS
PEARL RIVER
LAKE PONTCHARTRAIN
LEGEND
RESIDENTIAL
LOW DENSITY
MEDIUM DENSITY
COMMERCIAL
TRANSPORTATION
PUBLIC AND SEMI-PUBLIC
INDUSTRIAL
AGRICULTURAL & VACANT
MARSH
WATER
EXISTING
PROPOSED
MAJOR THRUWAY
INTERCHANGE

FINANCING

	Present	5/21/73 Grant Est.
Total Project	935,462.75	723,000
EPA Eligible*	915,462.75	703,000
Federal Share*	686,597.06	527,250
Local Share	228,865.69	195,750
Interceptor Costs (Includes Collection System)	655,880.75	573,138
% Share of Engineering and Other Costs Attributable to Line Work	125,134.77	83.5%

---

*USR&E estimates based on actual bids and grant application. Actual costs expected to be higher as result of bids opened July 29, 1974. EPA has tentatively agreed to cover increase in costs.

POPULATION

Present	798
Initial (1976)	1100
Design (2010)	2500
Ultimate	2500

St. Bernard Parish, Louisiana

1. Introduction

1.1 Project Description

St. Bernard Parish grew at the fastest rate of any parish in Louisiana during the decade 1960 to 1970. It is a suburb of the city of New Orleans, but contains a substantial amount of heavy industry, making it more than simply a bedroom community. Despite its growth, populations (about 36,000 at present) and inclusion in an SMSA, St. Bernard Parish has no incorporated townships. The first sewerage district in the parish was created in 1945, the second (which includes the grant project of the present study) was created in 1955, but in 1967 still had no sewerage treatment facility. A plant was built at Meraux, northwest of the present project area. Below Cypress Gardens, all the raw sewage collected was being dumped raw into the Mississippi River.

Proposed in this project is a 2.4 MGD secondary plant which will service the area between the 20 Arpent Canal and the 40 Arpent Canal, which run down the length of the parish, and between the community of St. Bernard Grove and the Lake Borgue Canal (see map #1).

Effluent from the community of Hi-land, which is presently dumped raw into the river, will be pumped through 4,630 feet of force main to a new interceptor, which will run parallel to the Arpent Canals along the route of the extension of Genie Street for a distance of 1,198.35 feet. This will be picked up by 575 feet of gravity line running to the sewage treatment plant. Although the initial length of the interceptor is small, expansion is expected.

A shrimp processing plant and a rendering plant currently discharge into the collection system of Hi-land but will be required to provide their own treatment once the present project is built. No other industry is or will be connected to the system. Once this high BOD load is removed from the treatment plant, it will be feasible to connect across the Lake Borgue Canal to the Violet Community, in order to divert its flow away from an oxidation pond which must be replaced.

1.2 History of Project

The initial contract with Burk and Associates, Engineers, was dated 5/18/71. The initial grant application was made under PL-660, and 33 1/3% funding was requested. The parish was advised that it would qualify for at least 50% funding, possibly 55%. The project was not funded until June 30, 1973, however, by which time PL-92-500 had taken effect. Because the parish was discharging raw sewage from the project area, EPA awarded a Step 2/3 Grant, a type now discontinued, which meant the facility planning phase could be avoided. Political conflicts have crippled regionalization of projects in the New Orleans area, and the project

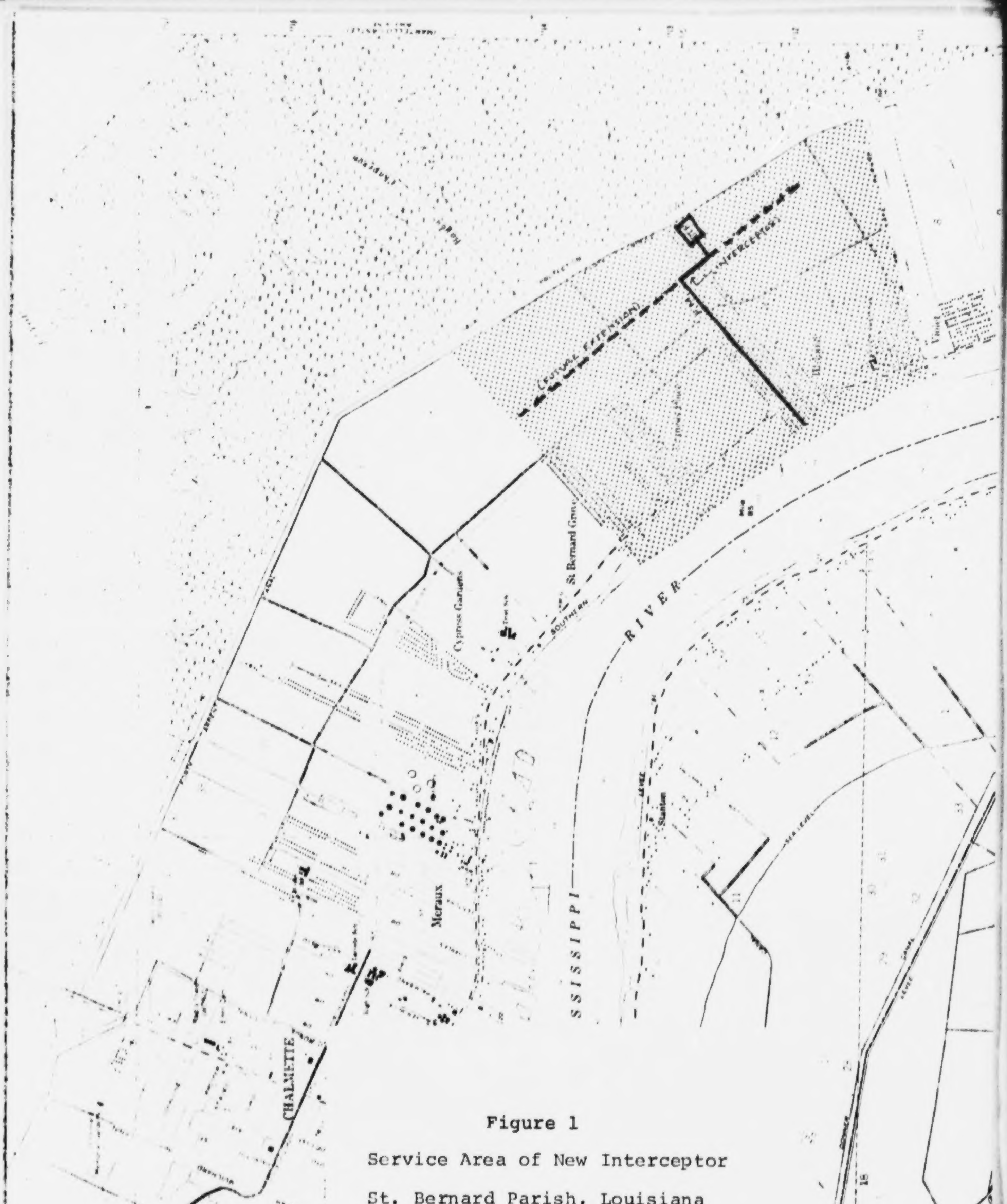

(FUTURE EXTENSION)
St. Bernard Grove
Cypress Gardens
Meraux
CHALMETTE
MISSISSIPPI
RIVER
SOUTHERN
Stanton

Figure 1

Service Area of New Interceptor

St. Bernard Parish, Louisiana

Sewer District #2

apparently would have been dropped for lack of regional planning had not the pollution effects been so strong. A reduction in the design period from twenty years to five years was then required, on the theory that when expansion is required, a full Step 1 analysis of regionalization would be inevitable.

In May of 1974, the state and EPA offices asked that the project be rescoped to Step 1. The 2/3 Grants were under scrutiny and determined to be an improper interpretation of the Act. St. Bernard Parish adamantly refused to do so, and the EPA regional office agreed to allow funding if an infiltration/inflow analysis was done and submitted upon completion of the Treatment Plant.

The construction of the project cannot begin until at least early 1975. A redesign of the Treatment Plant along new EPA guidelines has been required, including the provision of dual chlorination capability and an additional clarifier.

1.3 Project Purpose

The primary purpose of the project is to eliminate raw discharge from the Mississippi. The river is the water source for several communities downstream. By diverting flow to a treatment plant on the 40 Arpent Canal, not only will the effluent be treated, but it will discharge further away from any water intake point. The extensive oyster beds of the Parish will also benefit from treatment of sewage, as many beds have had to be shut down for periods up to several months when pollution levels were too high.

The secondary purpose of the project is to allow for population growth within the parish. Although absolute growth rates are higher elsewhere in the metropolitan area, for instance in Jefferson Parish, St. Bernard Parish has by far the greatest amount of vacant developable land proportionately of any parish in the New Orleans metropolitan area. Future residential growth really has no place else to go. Is development stalled without sewers? Without the construction of this project, it is probable that developers would install their own collection system and connect into the old pipes which discharge directly into the Mississippi. This is a situation in which growth will have a highly detrimental effect on water quality.

2. Population Projections

Population projections are subject to substantial variation. The projections for the Parish as a whole were derived from the U.S. Census figures for 1960 to 1970. A 4.8% compound growth rate was found and applied to the next three decades, yielding a population for the entire Parish of 210,000 by 2000. Consideration was given, according to the Interim Water Quality Management Plan, to figures found by the Regional Planning Board, Louisiana State University, and the Louisiana Department of Public Works. Burk and Associates figures fall on the high side of the projections: they predict 82,000 in the Parish by 1990, whereas the medium growth projection of the Planning Commission is about 70,000, and the Public Works Department figure is about 73,000.

The differences will be significant. This project will lie in the area where most of the growth, or lack of it, will be located. Sewer District #1 is much nearer to full development than Sewer District #2. Variations in population projections will have a proportionately greater impact in Sewer District #2 than in Sewer District #1 or the Parish as a whole.

Although the design period was reduced from twenty years to five years, the new population figures submitted by the engineer were basically identical to the original figures. The lower rate of growth first presented was said to be in error, and that growth within the service area will be much faster than first thought. The number of people to be served is quoted as a round number, 10,000 , when the project is completed. Its design population is exactly double, 20,000, and is to be reached by 1978. Housing starts have fallen off recently, as a result of tight money, and the short term growth of the service area might be significantly lower than anticipated.[1]

2.2 Land Use Projections

Land use projection has been informally done by the St. Bernard Planning Board, but a more explicit Interim Land Use Plan was published by the Regional Planning Commission in June of 1973. Five basic land use planning approaches are outlined for the New Orleans Region.

(a) Continuation of Present Development Patterns:
Considered the least desirable alternative

(b) Compact Development
Most desirable alternative; strictly controlled growth; condensation of development patterns;

---

[1] One factor which makes population forecasting difficult is uncertainty over the construction of a proposed limited access highway linking St. Bernard Parish and New Orleans. This project--the Trans-City Expressway--would provide an alternative to two heavily travelled and frequently congested highways and would undoubtedly stimulate residential growth along its route. Though the project has the support of the Regional Planning Agency and most local residents, it appears to be of low priority to highway planners. At this time, opinion is divided on whether or not the project will receive funding.

urban renewal in problem planning areas. Has aspects of inequity and economic inefficiency, however.

(c) Sprawl Development

At best, a planned version of (a); not very desirable. Implies extensive use of package plants.

(d) Logical Service Areas

Like (b) only less strict and incorporating existing growth centers and existing growth characteristics.

(e) New Towns

New and intensive planned development of new towns of Greenbelts, etc. Considered too ambitious.

The recommendation of the Commission was for (b) and (d) to be combined in the interest of equity and efficiency. It is difficult to see how this translates into their actual land use projections. Policy recommendations do not include a methodology for implementation. The St. Bernard Parish land use pattern in the Interim Land Use Plan for 1990 shows a spread of low density residential use down the leveed length of the parish indistinguishable from the present pattern of sprawl. It projects single family residential development of two large tracts currently used as orchards and grazing lands, whose owners are well known to be adamantly opposed to their sale to developers. The entire length of Judge Perez Drive is shown as developed for commercial use, a length of some miles. (Strip development is the predominant type of commercial development in St. Bernard Parish.) The Trans-City Expressway is shown constructed far down the length of the Parish, opening up a great amount of new acreage. A small amount of high density development is planned for the western part of the parish, and a moderate amount of medium density. The service area of the present project is shown as low density (single family) residential. The transportation plan shown is that of the Louisiana State Highway Department. No independent recommendations are submitted by the Regional Planning Commission proposing other transportation technologies.

Two important land use commitments with strong long range impacts for the entire planning area, one made and one yet to be decided, are the "Superdome" project and the deepwater port facility proposed at the Mississippi delta. The Superdome, at present a $160 million project with public funds, with widely promoted and debated potential benefits for the entire city, is treated as follows:

> "The "Superdome" stadium is well underway within the core area of New Orleans and is scheduled for completion in 1974. This will be a large addition for various types of activities and will create a plus to the economy and an increase in traffic."

The deepwater supertanker port is not mentioned in the Interim Land Use Plan, though proponents of the project say that, if implemented, it could produce a petrochemical industrial complex along the banks of the Mississippi reaching all the way to Baton Rouge. One would expect, if this were the case, that much of the high natural levee of St. Bernard Parish would face pressure for extended industrial development rather than residential/park development, as projected in the Interim Plan.

In sum, land use planning for St. Bernard Parish follows the natural ad hoc growth pattern, with no significant attempt made to change basic residential/commercial patterns. Reinforcement of this pattern is advocated through the construction of the Trans-City Expressway. Possible positive or negative spinoff from the success or failure of the huge Superdome project are not evaluated with reference to the city's largest available store of vacant residentially zoned land, nor is the potentially even greater impact of petrochemical development treated.

2.3 Current Trends in Population and Land Use

Because of a scarcity of mortgage money, there has been a pronounced decline in housing starts recently. There is no indication how long this trend will continue, nor how strong the resurgence of growth will be when it resumes.

St. Bernard's growth is often compared to that in nearby Jefferson Parish, which is also within the New Orleans Metropolitan area. Jefferson's boom was triggered by the construction of Veteran's Boulevard and sustained by the opening of I-10. An enormous residential expansion occurred in the late 1950's and 1960's, and will continue at a reduced rate into the 1970's. St. Bernard overtook Jefferson Parish in rate of growth in 1968, not because of any change in its own circumstances, but because Jefferson is approaching saturation at present density of development. Despite the severe constraints on land availability the adverse flood plain environment has enforced, land use patterns in Jefferson Parish follow the national norm with little variation. Strip development, shopping centers, and fairly large subdivisions are quite randomly distributed. Enormous pumping stations and levees hold back the encroaching waters to permit this low density of activity to take place.

St. Bernard, having a smaller amount of leveed land and being in a more perilous flood zone, has slightly different development patterns. It is almost impossible to assemble large subdivisions, because original land ownership under the Frency was based on the use of Arpents, a method of describing land ownership in terms of linear frontage on a navigable waterway, rather than in terms of total area. Because frontage on navigable waterways was the only significant land to own, the rest being useless swamp, parcels tend to have a short dimension (usually 1 Arpent, or 196.34 feet) on a waterway, and a long dimension incorporating all land between one waterway and the next. A standard piece may measure 196.35' x 6,000'. As the land was drained and divided, shorter pieces have evolved, but the general shape remains awkward. Developers can fit a two-lane street down the center of an Arpent plot and front many small lots on either side. No curves or deep lots are possible, reinforcing a very rigid pattern of subdivision.

The spokesman for the St. Bernard Parish Planning Board maintained that the parish is wary of the growth patterns of Jefferson Parish, and do not want unregulated growth to occur in St. Bernard. The relative isolation of the parish by comparison with Jefferson, because of the limited access across the Industrial Conal, he felt was to some extent appreciated by the residents, despite the inconvenience. He characterized them as being conservative and being indifferent to the lack of recreational, entertainment, or major shopping facilities in the parish. He felt that the reluctant landowners, who do not want to sell their land for development, represent a parish outlook. The implications of these appraisals were not shared by other officials outside the local planning board, but they did agree on the basic differences between St. Bernard and Jefferson in general and that the same enthusiasm for uncontrolled growth which characterized Jefferson's expansion would be less pronounced in St. Bernard. There may be a genuine difference in citizen outlook, or it may simply be that geography, transportation, flood danger, and financial constraints are the operating factors in the evident lag in St. Bernard's development relative to Jefferson's.

2.4 Land Use Controls

Zoning and provision of utilities are the only operating controls on land in this area. The zoning is described as being "very flexible", though not by the zoning board. The zoning board cannot, however, approve subdivisions unless sewers are provided, as the water table is usually only inches from the land surface in the developable areas of the parish. Septic tanks are an impossibility in virtually all urbanizing areas.

Witholding sewer funding is not desired by any of the planning boards. All long-range proposals for Sewer District #2 show it developed as "single family residential," with supporting commercial facilities. No one responsible wants to thwart that development; all of them consider it intrinsically desirable.

The spokesman for the St. Bernard Planning Commission was one of the very few to find fault with the Parish's development pattern. His opinion seemed to be based on what he regarded as the wastefulness of the local life-style, and on aesthetic judgments. He noted that the Parish has no architectural heritage, and that the design of the new houses is not very attractive. Strip commercial development is favored even over shopping centers; the most attractive areas of the parish are the agricultural sections, but they may well be eliminated and replaced by subdivisions within 10 or 20 years. The huge industrial plants contribute obvious air pollution from enormous stacks, especially at the Kaiser Aluminum Plant which has a stack "you could drop a freight car down." Thus, he implies, if aesthetic judgments are in any way connected with land use reform, St. Bernard Parish will not be a leader. The population is middle-class, and thoroughly oriented toward the consumer life style. Despite its shortcomings, the Parish has many features which the residents evidently feel very happy with: there is little crowding (except on the highways), little crime, little racial tension (the area is informally segregated); the taxes are low, the schools are good, and the garbage is picked up five times a week. Living there means relative luxury compared with the life residents are escaping in the decaying central city.

The only kinds of land use control which most area residents would condone, as things now stand, would be control of industry, new canal construction, or any other type of development which would interfere with the present pattern of suburbanization.

3. Land Use Impact Evaluation Process

3.1 Governmental Review

The A-95 review process for this project was routine. No comments were received by the Commission on Intergovernmental Relations, as is reportedly common for all sewer projects.

The most significant event in the evaluation of this project was the controversy about the return to Step 1 in order to better comply with the provisions of PL-92-500. One state official said that to have returned to Step 1 would in no way have altered the timetable of the project nor would it have caused additional expense in the long run. His only explanation for the refusal to re-scope the project was stubbornness on the part of the local agencies. The engineer, however, maintained that a full infiltration/inflow study, as opposed to the briefer infiltration/inflow analysis which they had already done, would be very expensive and time consuming. Furthermore, a study of regionalization would be necessary and great delays would be inevitable.

The EPA's interest in rescoping the project appeared primarily procedural, undertaken in order to comply with legal directives. For several reasons, greater regionalization of the project was not expected. First, the parish is isolated from any other developed area by the river and the Industrial Canal on one side, and by bayou on the other.

Orleans Parish already has committed funds to an extensive self-sufficient system of its own. Also, inter-jurisdictional cooperation is quite difficult in Louisiana. The state's legal heritage comes from the Frency Napoleonic code, and requires that inter-parish disputes be resolved by special third bodies. Also, one frequently hears that political in-fighting is common on the local level. It is hoped that this project will eventually be expanded to pick up flows from farther down the parish, so that final discharge can ultimately be released farther upstream from the oyster beds. This regionalization can be accomplished with no alteration to the present construction documents, and would be studied under Step 1 of any future grant to expand this system. Presumably there would be no political opposition to this regionalization because the entire project would remain under control of one Sewerage District.

3.2 Non-governmental Involvement

Several years ago the Army Corps of Engineers proposed a canal between the Intracoastal Waterway and the Mississippi River, which would have bisected the developed section of St. Bernard Parish. This was strongly opposed by several environmental groups and has apparently been abandoned. The environmental groups have remained active and continue to oppose encroachment into the wild areas of the bayou. They have not, however, opposed the development of the existing reclaimed vacant land in St. Bernard Parish, nor have they publicly opposed the sewering of this vacant land on the grounds that it could induce adverse environmental effects. The groups were not reachable for comment at the time of this study to expound their general position on urbanization in the New Orleans area.

Although land developers operate in the area, it seems that the available parcels are comparatively too small to warrant the attentions of very large organizations which might yield considerable political strength. If there is any informal cooperation between local agencies and private development interests, it was not discovered in this study. Speculation in land does exist in the parish.

4.0 Influence of the Impact Evaluation

The Interim Water Quality Management Plan for Sewer District #2, produced by Burk and Associates, Inc., January 30, 1973, is the only impact evaluation which has been done. It finds no evidence of adverse environmental effects, and has not been contested on environmental ground by any agency. It has been felt that the elimination of raw discharge from the river is of such overriding importance that all intervening difficulties with the project are secondary.

5.0 Other Project Attributes Influencing Land Use

5.1 Project Staging

At present, only a comparatively short section of interceptor is to be built. It is built to be easily extended, however, and ultimately will serve the almost completely undeveloped area surrounding it. Staging, in the longer term, will involve greater regionalization (see 5.3).

5.2 Project Financing

St. Bernard Parish's share of the capital cost of the project, presently estimated at $399,980, will be paid out of parish cash reserves derived from the parish sales tax. This is a 2½% levy added to the state sales tax. Thus, present and past residents, but not future residents are paying the full cost of reserve capacity of the system.

Operating costs will be covered by a user charge, consistent with EPA regulations. The rate has not yet been estimated.

Connections to the interceptors must be paid for by the users. Thus, developers must lay their own lateral lines to the system and will pass their costs on to the new residents.

5.3 Regionalization

Aspects of regionalization have already been covered in 2.2 and 3.1. Certain technical difficulties of regionalization should be brought up.

The land next to the river has built up by siltation to a level two to three feet higher than the general level, producing a natural levee--the prime site for development. This has been taken over by industry, for the most part, as industry has preceeded residential development in areas away from the original center of New Orleans. The more flood prone lower land has been developed residentially, with costly levees and pumping stations. In these areas, the water table is very close the surface.

The natural way to lay sewer lines in St. Bernard, as elsewhere in the region, is perpendicular to the river, taking advantage of the natural slope.[1] However, St. Bernard's direction of development is parallel to the river. To lay interceptors in this direction is difficult, because the maximum depth of installation which the high water table permits is 14 feet. Below that, infiltration and service problems become extreme. A natural pattern of sewage treatment systems becomes a series of interceptors perpendicular to the river, each served by a small treatment plant. To avoid this, extensive use of force mains will be required to pump flow back up along the line of the river to the proposed treatment plant. Economies of scale of the treatment plant will justify this, as will the parish's interest in minimizing downstream discharge and its consequent greater harm to the shellfishing industry.

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[1] The early construction of sewer lines in the Hi-land area was contrary to the natural slope of the land. Since housing was close to the river, no great difficulty was encountered. There was no treatment plant; the interceptor flowed directly to the river. This has necessitated the use of force main in this project to return the flow from the old part of town to the new plant.

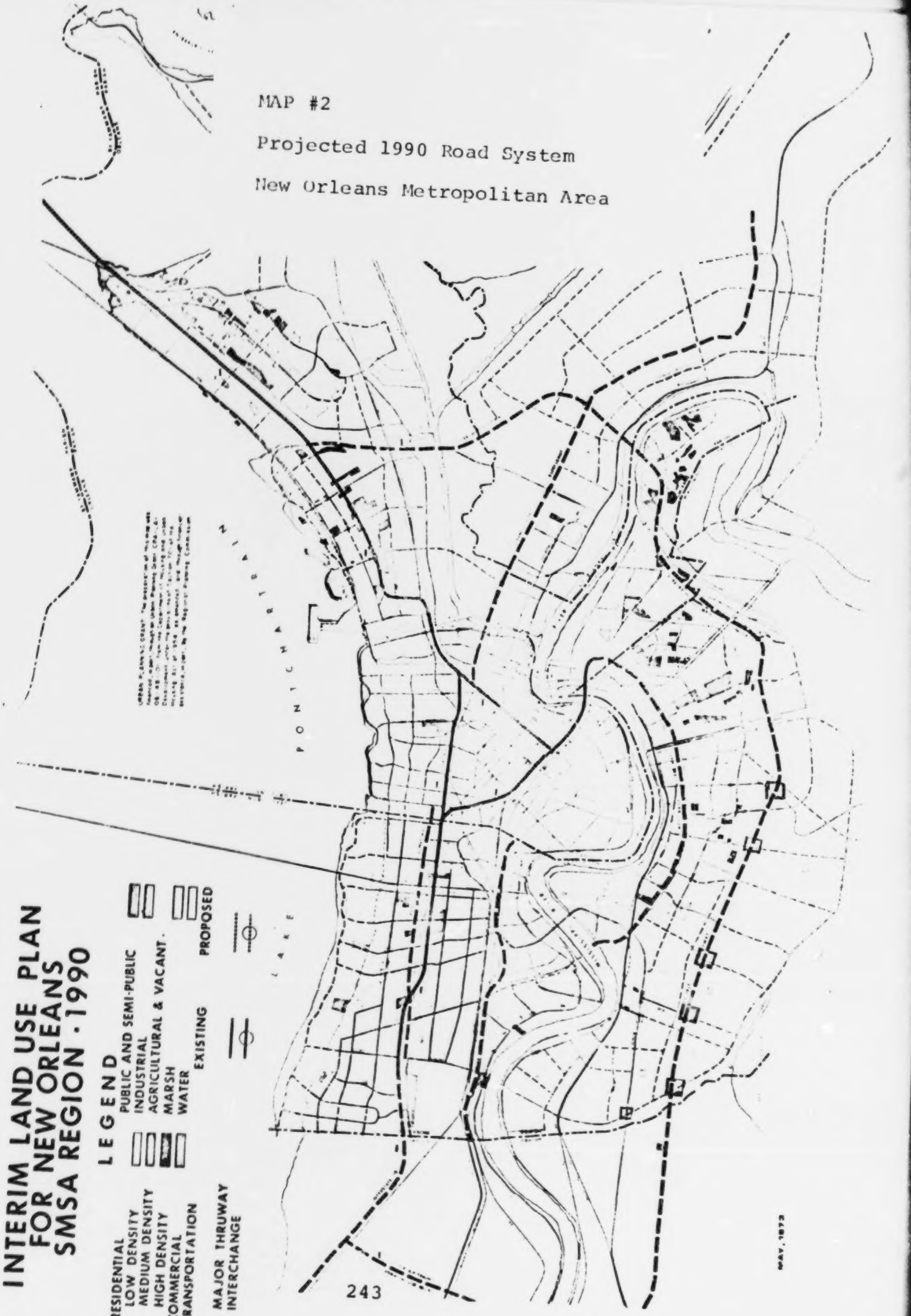
APPENDIX

ST. BERNARD INTERCEPTOR

MAP #2

Projected 1990 Road System

New Orleans Metropolitan Area


INTERIM LAND USE PLAN
FOR NEW ORLEANS
SMSA REGION · 1990
LEGEND
RESIDENTIAL
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
COMMERCIAL
TRANSPORTATION
PUBLIC AND SEMI-PUBLIC
INDUSTRIAL
AGRICULTURAL & VACANT.
MARSH
WATER
MAJOR THRUWAY
INTERCHANGE
EXISTING
PROPOSED
LAKE
PONTCHARTRAIN
MAY, 1972

ST. BERNARD

Appendix

Project Data

Length	1775'	4630
Type	Gravity	F.M.
Area served	- 1650 acres (2.58 mi^2) -	
Maximum diameter (inches)	- 36"	14"
Average initial flow	1 MGD	
Average Design flow	2 MGD	
Average Ultimate Flow	3.6 MGD*	
Cost	80,300	56,400

*Based on a maximum capacity of 36" pipe. Could reach such a flow if plant were part of greater regionalization, i.e., if service area were enlarged.

FINANCING

	Date. June 30, 1973	
Total Cost	1,599,900	
Total EPA Cost of Profit	1,599,900	
Federal Share	1,199,920	
Local Share	399,980	
Interceptor Cost	80,300	
Force Main Cost	56,400	8.54%
% Share of Engineering & other costs attributable to interceptor	19,159.59	(6.22%)

POPULATION

	SP #2	Project Area
Present	36,000	10,000
Design (1978)		20,000
Ultimate		36,000

Tulsa-Broken Arrow, Oklahoma

1. Introduction

1.1 Project Description

Tulsa Oklahoma is undergoing very rapid population expansion. Most of this expansion is concentrated in the southeast quadrant of the city, where new suburbs and new industry are moving (see map #1). In order to implement a regional solution to the sewage treatment problem, Tulsa and the adjacent suburb of Broken Arrow have formed the Regional Metropolitan Sewer Authority. This agency is initially charged with the planning and construction of a sewage treatment plant and interceptor system serving the Haikey Creek Watershed, 23,600 acres of land which straddles the Tulsa/Broken Arrow boundary. 57 per cent of the watershed lies within the Broken Arrow City Limits and Annexation fence, the rest within Tulsa's City Limits.

A repeatedly quoted press clipping dated 9/17/72 describes Broken Arrow as "the fastest growing City in Oklahoma." Whereas important local pollution problems presently exist which may be corrected by this project, it is the future residential development of the area which is at the heart of the project.

The land is currently almost entirely unoccupied.

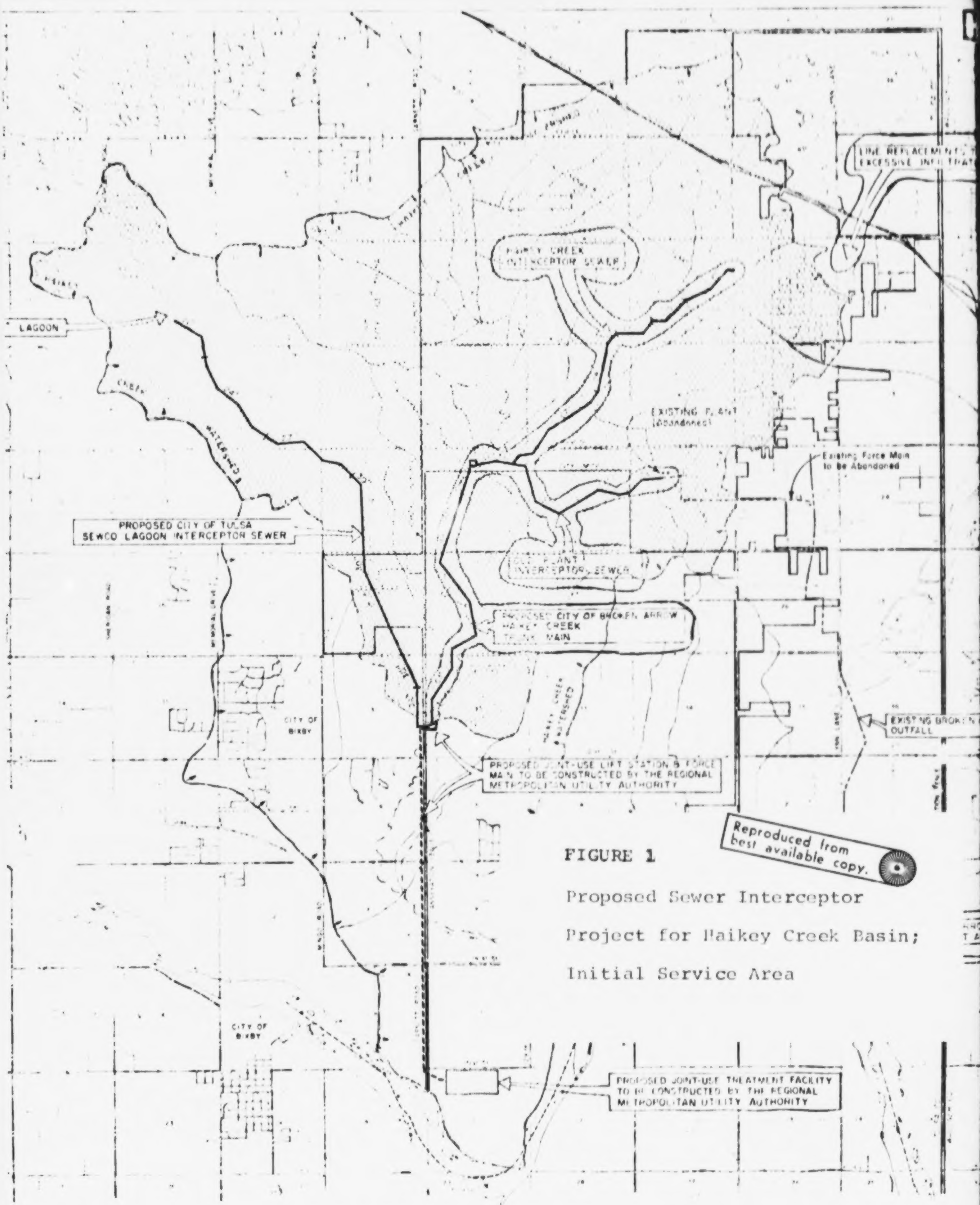

LINE REPLACEMENTS T
EXCESSIVE INFILTRAT
HAIKEY CREEK INTERCEPTOR SEWER
LAGOON
EXISTING PLANT (Abandoned)
Existing Force Main to Be Abandoned
PROPOSED CITY OF TULSA SEWCO LAGOON INTERCEPTOR SEWER
OLD PLANT INTERCEPTOR SEWER
PROPOSED CITY OF BROKEN ARROW HAIKEY CREEK TRUNK MAIN
HAIKEY CREEK WATERSHED
CITY OF BIXBY
EXISTING BROKEN
OUTFALL
PROPOSED JOINT-USE LIFT STATION & FORCE MAIN TO BE CONSTRUCTED BY THE REGIONAL METROPOLITAN UTILITY AUTHORITY
CITY OF BIXBY
PROPOSED JOINT-USE TREATMENT FACILITY TO BE CONSTRUCTED BY THE REGIONAL METROPOLITAN UTILITY AUTHORITY
Reproduced from best available copy.

FIGURE 1

Proposed Sewer Interceptor Project for Haikey Creek Basin; Initial Service Area

Sparse settlement along the section lines (the one-mile square surveying grid pattern on secondary roads) is now in existence, but the central parts of the grids are open land, either farmed, used for grazing, or completely vacant. It is this land, with excellent characteristics for homebuilding but poor for the percolation of the soil, which is ripe for development, and which is obtainable comparatively cheaply and in sufficient quantity for large scale development.

1.2 Project History

In late 1969 and early 1970, the Tulsa Metropolitan Area Planning Authority studied the sewerage problems of the Southeast Tulsa/Broken Arrow areas and the Board of Directors adopted a plan for regionalization in April of 1970. At that time, the Water and Sewer Commission of the city of Tulsa was also studying the problems of the area in two committees, one for long-range and one for short-range planning. It became clear that a regional plan with the city of Broken Arrow would be a desirable one, and, with the TMAPC recommendation also in mind, the Water Commissioner combined short- and long-range studies and appointed a Regional Metropolitan Utility Authority to create a system serving the two jurisdictions.

W. R. Holway and Associates, Inc., engineers, had been designing a system to serve Broken Arrow. With the creation of the Authority, they were retained to design the enlarged system, which, basically, entailed the addition of the northwest arm of the system which lies within the Tulsa City limits.

The EPA Regional Office in Dallas approved three Step 2/3 grants for the Tulsa/Broken Arrow Project in June of 1973. Bids for the various contracts have been submitted, and, but for one, accepted. Construction has begun in some parts of the project, and will be completed in about two years.

1.3 Project Purpose

The purpose of the system is two-fold. First, an immediate pollution problem exists in both cities. Tulsa's "Sewco" lagoon near Memorial Drive and 76th Street is a great nuisance to local residents and is over capacity. It must be eliminated. In Broken Arrow, one of the existing two treatment plants was closed in September of 1970 and its flow pumped to a newer plant, the result of a suit against the old plant by a downstream landowner. The newer plant now handles the entire city's waste, generated by 13,000 people, even though it was designed to serve only 10,000.

The second purpose of the project is to handle the tremendous growth pressure for residential development in the area. There has been intense land speculation and heavy pressure from citizens to open up the land. Only a proper public sewer system will adequately serve the type of growth expected, as the land is largely unsuitable for septic tank use.

There is no feeling amongst the many participants in the development of this project that the sprawled out life-style of the Oklahoma plains has any inherent defects. The consulting engineer on the project said that the debate about urban sprawl is "blown out of proportion." Important civic leaders and businessmen have moved out to the area, established luxurious country clubs, and been instrumental in opening up the land for Tulsa white collar workers. The advent of the Ford Motor Company Glass Works on the border of the present project area is now bringing a blue collar class into the same area, and away from the old industrial developments on the Arkansas River to the west of town. Tulsa is changing in many ways, but it is still a rich city, attracting a more varied cross section of industry now, but with every prospect of continued economic success in the foreseeable future.

2. Land Use Planning

2.1 Population Projections

Populations projections for the Tulsa Metropolitan Planning Area (TMA) were developed as part of a housing study by Hamer, Siler, George, Associates,(formerly Hamer, Green, and Siler), Washington D.C., under contract to the Tulsa Metropolitan Area Planning Council. TMAPC provided these to the engineer, and coordinated their estimates with those done by the Indian Nations Council of Governments (INCOG). Using these as guides, the project engineers, Holway and Associates, developed their own estimates and used Tulsa Water and Sewer Authority figures for probable ultimate densities as the basis for sizing of pipes for ultimate flow.

The basic recommendation was to build to accept an average of 2,000 connections per year. Tulsa's population in 1972 was approximately 360,000; Broken Arrow's was approximately 16,000. The total INCOG region population in 1970 was 475,264, and is projected to be 561,000 in 1975.

The following figures show the trend of development in the two cities, in those portions which will be served by the project. The Design Population refers to the population served by the pumping station between the two projects, not the design capacity of the pipes, which is considerably greater.

City	Estimated Current Population	Initial Population Served	Facility Design Population (1980)
Tulsa	360,000	5,000	18,400*
Broken Arrow	13,000[1]	7,200	18,400*
TOTAL		12,200	36,800

[1] Sewered
*See discussion

Ultimate population in the service area is difficult to predict, but was done on the basis of ultimate densities proveded by the Water and Sewer Board. The initial project within the Tulsa area is the Sewco lagoon interceptor. This serves a basin of 4,130 acres. At a density of 10 persons/acre, the estimated population connected to this interceptor will be 41,300, yet by that time additional lines in other sub-drainage basins will be installed, making the ultimate population within the entire Tulsa section of the Haikey Creek Basin possibly as high as 102,000 if it is developed to the same density. The only long-range figure for the Broken Arrow side of the project was a projection of 26,400 on its initial interceptors by 1985. Design flows for both projects are presented without accompanying population figures, as they were contained in the Grant Application.

City	Initial Flows	25 Year Flows (2000 A.D.)
Tulsa	.2 MGD Ave.	5 MGD Average
		11 MGD Max. Wet Weather
Broken Arrow	.52 MGD Ave.	7.7 MGD Average
		27.5 MGD Max. Wet Weather

Tulsa's fertility rate is below the national average, which itself has been showing a marked decline. The medium age of the city has dropped; women of childbearing age in Tulsa increased in numbers 22% between 1960-1972, yet the number of births declined 24%, the fertility rate dropped 41%.

The Tulsa region attracts a great number of in-migrants. Except for specialized situations, such as retirement communities or universities, immigration is a function of employment growth. Although male participation in the labor force nationwide is declining, due to increased time spent in school, early retirement and a younger labor force age profile, female participation is increasing, more than offsetting the male decline. In-migration of general population, then, now requires a proportionately greater number of jobs to sustain it than previously. With more women working, moreover, the trend toward smaller families, especially in this area, seems to be more than temporary. One result has been to reduce the number of children in school and create financial stress on the school system, which has been financed on a "per pupil" basis.

While the total SMSA in Tulsa is growing, some regions within it actually are declining in population. Most of the thrust of development in Tulsa has been to the southeast, so much so that this quadrant is experiencing growth well in excess of 100% of the growth of the Tulsa Metropolitan Region - perhaps as much as 200% of that figure. This means that housing in some areas is being abandoned outright, and on a large scale.

While the methods of population forecasting in the project region appear fully realistic overall, one minor adjustment was made for overtly political reasons. Because the project is being financed by two separate municipalities - Tulsa and Broken Arrow - and because no accurate housing model existed to divide the expected influx between the two jurisdictions, the engineer arbitrarily assigned equal shares of population to each town in tabulating design year population. Because Broken Arrow was felt to be sensitive that the larger city was the dominant partner in the regional plan, and because the Tulsa voters might react against an apparent subsidy of another community, the equal split was invented. It may be that Broken Arrow may receive more population at first than Tulsa, as more developments are currently underway there.

2.2 Land Use Projection

Within the project area, land use is projected to be primarily residential, with supporting commercial and office facilities. Most of the established industry in the TMA has been to the north and southwest. This, among other factors, has made these areas less desirable residentially, and they have attracted less industrial growth in recent years partly because of the depletion of the labor force. Infrastructure for further growth is good in the southwest still, but two major new employment centers - The Ford Motor Co. Glass Works and the regional office of Metropolitan Life Insurance - have located along the Broken Arrow Expressway just ac.oss the northern border of the Haikey Creek Basin.

Over the past decade, most of Tulsa's employment growth has been white collar, as exemplified by the Metropolitan Life decision to move to the city. The growth in both income and numbers of the white collar middle class has been a major factor in the expansion of the city to the southeast with many rather expensive subdivisions. With the arrival of Ford, however, one sees the beginning of a new blue collar employment growth, which is locating along the line of expansion of the white collar residential community. This plant may be unique, but it may also represent the ability of Tulsa to attract a kind of heavy industry that need not locate in the old industrial areas near the Arkansas River, but which can locate closer to the labor force.

Observation of this land use behavior was the basis for the regional plan. The funding of the interceptor project on the basis of the obvious pressure to develop in this sector has perhaps reinforced the intensity of land speculation in the area. The engineering firm has been inundated with calls asking about the location of the interceptors, the date when it could reach a certain site, etc.

2.3 Recent Trends in Population and Land Use

Though recent trends in population and land use behavior in the Tulsa Metropolitan Area begin to show a slight slackening in the rate of population growth, there is no reason to revise the initial design year projections down. The amazing suburbanization of Southeast Tulsa has caused consternation to local planners, as it has become evident that the center city is losing population, retail trade, and office occupancy to suburban centers. As the old population has moved to the southeast, the north side of the city has become predominantly black, and the remaining whites are now abandoning housing there at a dismaying rate. Gilcrease Hills, a luxurious and well planned development on the north side, has not grown nearly as fast as anticipated, despite the area's great convenience to downtown. The half-hour commute from the Broken Arrow region is apparently not perceived as a significant inconvenience by commuters going to the Central Business District (CBD), and many new jobs are located within the newly developing region.

The secondary effects of this population migration on providing city services are onerous. As the white and middle class black population moved away from the north and west areas, for example, new schools had to be built in the southeast section of the Tulsa Metropolitan Region. At the same time, the growth in the population of school age children has slackened off, leaving some of the new capacity unfilled, and some schools in the north and west almost empty. Furthermore, as the schools are financed on a per-pupil basis, population migration coupled with declining attendance rates have put a double burden on the school system.

Other public services face similar disruptions. police and fire protection, previously based in central Tulsa, face the expense of setting up and maintaining satellite facilities closer to the population centers. The costs are disproportional to the population increases, making per capita costs of police and fire protection higher.

Comparatively little has been done to ameliorate these adverse effects of population migration. A reevaluation of Tulsa's growth was undertaken by INCOG in the early 70's, and a report by Hamer, Siler, George, Inc. was issued in December 1973 entitled Vision 2000. The thrust of the report was the idea of "balanced growth," which meant, essentially, a more symmetrical growth pattern around the central core, and a revitalization of the CBD. The influential Williams Corporation has recently financed a five-block project on the river very near the center of Tulsa. It will be the first multi-purpose development in the area in some years. It will incorporate some apartments, but will not be heavily residential in nature; rather the new image of the CBD will be more specialized - a commercial and business oriented area by day, and an entertainment center by night. Pedestrian malls with large parking garages are part of the new design of the CBD. Other business interests may follow the Williams Corporation's lead, but while this sort of revitalization of the core may save the economy of the CBD, it will not have substantial effect on residential development.

It is significant that no negative, only positive, inducements are planned to encourage the desired symmetrical residential growth around a revitalized CBD. Positive inducements include new roads, new utilities (including sewers), new recreational facilities and parks, and perhaps favorable tax arrangements. Negative planning tools, such as no connection orders on sewers, building restrictions, denial of road improvements, and the like, have been specifically rejected by planning agencies and city officials.

There are signs of spontaneous changes in residential land use which might eventually move toward a more compact sort of development. The "energy crisis" is one: there is a small but growing feeling that fuel shortages for automobile travel and home heating may make living in a single family house distant from the place of work a questionable investment. However, this change of attitude is not now widespread and may be wishful thinking on the part of planners. A more significant trend, perhaps, is the development of condominium living, increasingly popular amongst the younger, newer residents of Tulsa. Apartment complexes with elaborate recreational facilities have been commercially successful. Swimming pools, night clubs, tennis courts, and golf courses are provided around a fairly dense cluster of adjoining housing units. Young families with few children find the social life and low apartment maintenance to their liking. While the overall residential density of such complexes is no higher than ordinary single family house development, there is a discernable trend away from the rigid single family house style of living which may be exploited in the future.

In sum, Tulsa is making no definitive policies to change its land use patterns, and is not exploiting current trends to reach its announced goals. It seems likely that, without certain restrictions in the southeast sector to allow positive inducements for growth in the northern and western areas to take effect, the positive inducements will merely cause the city substantial expense and confuse future growth patterns.

2.4 Land Use Controls

The two basic controls over land use are zoning and the provision of sewers. The zoning code designed and administered by the Tulsa Metropolitan Area Planning Council was copied almost intact by Broken Arrow. Tulsa maintains zoning authority, in addition, over the unincorporated county land within a five-mile radius of its city limits. Within the last few years, a holding category, AG-1, (agricultural), has been added to the code so that vacant land, previously zoned to the highest residential use (single family detached homes) must be rezoned parcel by parcel to residential or commercial use. There is no hesitance on the part of TMAPC or the Broken Arrow Zoning Board to rezone to residential use, providing financing and design are proper. The consensus is universal that the Haikey Creek Area should be developed for residential use. Everyone seems to agree that this rapid suburbanization is an outward sign of Tulsa's great economic success. Although the planners seek to make it more "balanced" in distribution around the city, the future development of Haikey Creek is taken for granted. The only debatable issue is what degree of commercial development is to be allowed at each major intersection. This is determined by the amount of traffic the intersection can bear.[1] Major shopping centers frequently exceed the limited capacity of the section-line roads. Improvements to these roads are the province of the traffic engineers, and their financing is behind the demand, another example of development pressure outstripping the potential for provision of secondary services. As shopping centers have been found to attract 65% of their shoppers from outside the southeast Tulsa area,[2] this is a very significant consideration.

The provision of sewers is of great importance in affecting land use. Because of state laws, septic tanks are not permitted in new developments.[3] Several subdivision permits in the service area have been withheld pending completion of the present project. If the project is not completed on schedule, actual no-connection orders may have to be implemented in the other districts of Broken Arrow presently using the existing plant. Development has been temporarily diverted to the other service area away from Haikey Creek, and is overloading that facility. No consideration has been given to limiting sewer availability in the future to control growth despite the cities' clear power to do so. Rather, positive inducements are considered the only valid planning tools

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[1] The general rule has been to allow 10 acres of commercial development per quadrant of intersection. In addition, the roads could support 20 to 30 multi-family dwelling units, and a small amount of office space. The rest would be single family housing.

[2] *Vision 2000*; *Phase 2*; *Economic and Land Use Analysis*; Hamer, Siler, George Associates; December, 1973; p. 59.

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[3] The current requirements for use of septic tanks are as follows:

Minimum Lot Size Permitted	Conditions
35,000 ft^2	percolation of 1" in 30 minutes or less
1 acre	percolation of 1" in 60 minutes or less
22,500 ft^2	percolation of 1" in 30 minutes or less and approved public water supply

Even these conditions may be too generous for use in subdivisions, but in practice they have put an end to septic tank use in the Haikey Creek Area. Land Prices are now (Summer 1974) about $3000 for a plot 80' x 120'. There is much greater profit for developers if public sewerage is constructed.

and withholding of utilities is considered an unwarranted interference with the free market system.

3.0 The Land Use Impact Evaluation Process

3.1 Governmental Review

The planning for this project was begun under the PL660 program, and all major design decisions were made prior to the passage of PL92-500. However, with the advent of the new law, a decision was made to finance final planning and construction with 92-500 funds, under a combined step 2/3 grant. This grant was awarded in June 1973, and after a series of preliminary submissions, the project plans and specifications were submitted in March of 1974. During this final planning period, only one major change was made in the plans developed under PL660--an arm of the interceptor system was deleted because it would not be required during the initial design period.

The Tulsa/Broken Arrow project was controversial within EPA because of its large reserve capacity. The mission of the grant program as legislated is simply the elimination of water pollution, and does not involve planning for growth.

Obviously, the projects represent a substantial expenditure of money with political ramifications. The issue of reserve capacity had to be analyzed in such a way as to form a general policy to be applied to all projects.

The priority system of PL92-500 by which a state selects the order in which its projects will be funded, if they qualify, is ostensibly designed to rank projects in order of their potential beneficial effects to the environment. Thus, present discharge of inadequately treated waste counts heavily. Each state designs its own formulas, but they are closely parallel, following EPA guidelines. Since absolute impact of a project on the receiving waterway tends to be counted more heavily by EPA than relative deterioration of water quality, large projects find priority over smaller ones, though the degree of deterioration of a small receiving stream may be just as bad as a large one. One calculation designed to reveal absolute rather than relative impact is the enumeration of "population affected" by a project.

In order for a project to rank high, the figure used for population affected may be increased by considering, not just those to be directly served, but also those downstream of the discharge point, or even those who may move into the area. In the interest of uniformity, it is generally the policy of EPA in Region VI to allow only those who will connect initially to the system to be counted. While this tends to favor heavily populated areas, where growth is ordinarily concentrated and where the greatest expenditure is justified, it becomes an argument against financing a system for residents who are not yet in the area. A dilemma is created, perfectly exemplified in the T/BA project, by the conflict between present and future need and the funding priorities of the government. Especially in the later disallowed 2/3 grants, where Step 1 facility planning had not formally been done, some restriction of project scope was demanded.

Although it was hoped this project would clarify the issue, the decision was made not to decide the general case, with its politically controversial overtones, but that each future project should be decided on its merits, and on the issue of cost effectiveness. Thus, mechanical facilities are designed for modular expansion, and line facilities, which have great economies of scale, are installed for ultimate future flows as presently projected. In effect, EPA defers to the land use projections of the client area, and reviews the population and land use projections only on technical grounds, not on policy grounds.

In the present case, an interceptor arm was disallowed on the premise that development would be adequately served in the short term by the other line work. It will be added to the project later. The diameter of the trunk lines, however, is fully sufficient to serve the entire region above it in the usual suburban land use density, so what appears to be a policy decision about land use is only a tentative one.

3.2 Non-governmental Involvement

No public reaction against the long term impact of the present project has appeared. Even the planners, anxious to promote the *Vision 2000* "balanced growth" idea, have agreed that the present momentum of the development boom in the area demands the system, and that no negative tools should be used to redirect growth such as withholding public sewerage.

Several major developers were advisors to the Regional Authority in the design of the project, and were instrumental in developing the financing procedures for the 25% of the cost to be borne locally (see 5.2).

The public hearing records special emphasis by those attending on the pollution control aspects of the project, especially the elimination of the infamous Sewco lagoon. There was total agreement that the project is a progressive one for the region as a whole.

4. Influence of the Impact Evaluation

The project was passed by the state clearinghouse; the Oklahoma Office of Community Affairs and Planning, on January 8, 1973. The only comments submitted to that office came from the State Highway Department: "If any Transmission lines are to be located within our existing highway rights-of-way, such plans must be cleared by the Division Engineer in Tulsa, Oklahoma."

An Environmental Assessment of the project was written by Holway Associates.[4] Land use considerations did not form a part of their analysis except in direct connection with the immediate physical construction of the project, except for the section entitled "Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Here, an "environmental cost" of not building the project is assessed as follows: "This environmental cost is manifested in restriction of growth and prosperity, limiting land usage to lower orders than would otherwise be possible, and eventual gross pollution of the environment."[5]

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[4] *Environmental Assessment for Construction of the South Arkansas Regional Wastewater Facilities; The Sewco Lagoon Interceptor Sewer; The Haikey Creek Watershed Interceptor Sewers*; W.R. Holway and Associates, Inc., Tulsa, Oklahoma (undated).

[5] *Ibid*., p. 63.

The EPA Regional Office for Region VI approved three Step 2/3 grants for the Tulsa/Broken Arrow project in June of 1973.* Because of the immediacy of the pollution problem in the Tulsa/Broken Arrow area with so many developments going in, and because of the advanced stage of the planning at that time, it was deemed unnecessary to go through Step 1. Some changes were made in the overall layout - one branch of the Broken Arrow interceptor was deleted by EPA because it would not be immediately needed, and the southern leg of Holway's original all gravity system was replaced by a force main as an interim economy measure.[6] The three grant projects now form a Y-shaped system. The deferred northern arm will be constructed when needed, and the force main will eventually be replaced by gravity sewer when the southern basin is developed.

Under the section "Irreversible and Irretrievable Commitments of Resources which would be involved in the proposed action, should it be implemented," only commitment of construction resources and energy for building are enumerated. The land thus opened for development and converted to urbanized development from its natural state is not listed as a non-renewable resource.

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[6] See map 3.

The impact evaluation has, thus, had no significant effect on the design of the interceptor. Land use commitments were not cross examined critically, for none of the participants considered the suburban expansion which this project will promote to have any intrinsically undesirable features. The only reservations about land use consumption patterns on the area have had to do with symmetry of development, around the central Tulsa core. These reservations were not yet well enunciated, and are even now in no measure strong enough to lead to any redesign of the project, were that still possible. Density of land use, intensity of energy consumption by transportation and life style, and similar considerations were not considered by any of the participants in their assessment of this project.

5. Other Attributes Influencing Land Use

5.1 Project Staging

The project will be staged both in expansion of its line work and in expansion of pumping stations and treatment facilities. The lines will be extended to serve the north-central section bisected by the town line (see map). This will be the first addition, and will require upgrading of the central pumping station to increase the flow through the force main. A later extension will be the replacement of the force main with a full gravity trunk line serving the entire lower section of the basin. The timing and sequence of these extensions will allow for the more orderly growth of the region. Developments, and the requisite secondary services, will be more centralized and less expensive.

5.2 Financing

The ultimate capital cost of the designed system to be borne by the local residents is now estimated to be between $500 and $600 per acre. To raise the money, the Regional Authority gave landowners the option to buy "debentures," good only to use to pay ultimate connection fees. While these so-called debentures will not be honored in cash by the Authority, they will appreciate in value, against future fees, by about 6% per year. Residents currently living in the area could buy these, in very small denominations, to pay for the charges their acreage will incur when it connects to the system. However, the developers put up the vast majority of the capital. Sales were stopped at $400,000, enough to pay for the system, but with some uncommitted reserve capacity left over.

In effect, it is the future residents who will bear a greater portion of the cost of the system. Developers will pass on the cost of the "debentures" to the ultimate owners, and those buying land not now covered by debentures will pay disproportionately higher connection fees in cash. The surplus will be applied to future capital expansion of the Treatment Plant. The system is accepted by the developers - in fact, they invented it as financial advisors to the Metropolitan Regional Sewer Authority. Under Oklahoma law, septic tank use must follow strictly prescribed regulations, and cannot be allowed on plots as small as those which will be built in the service area. In order to develop at all, the developers had to find a way to pay for the city's share of the project, and later pass it on to their clients, who will still be able to buy housing cheaper than if they had to buy enough land to make a septic tank system legal.

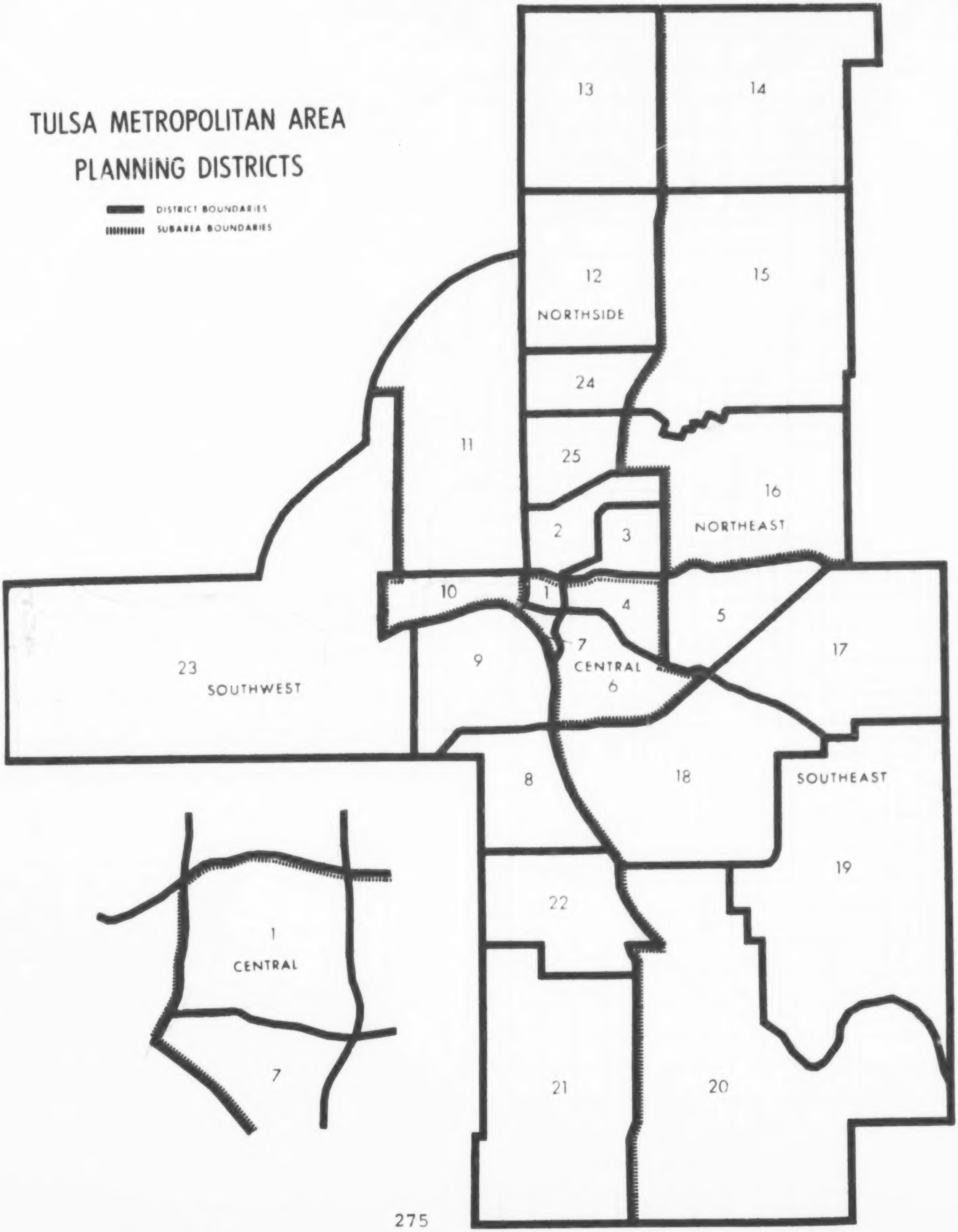
5.3 Regionalization

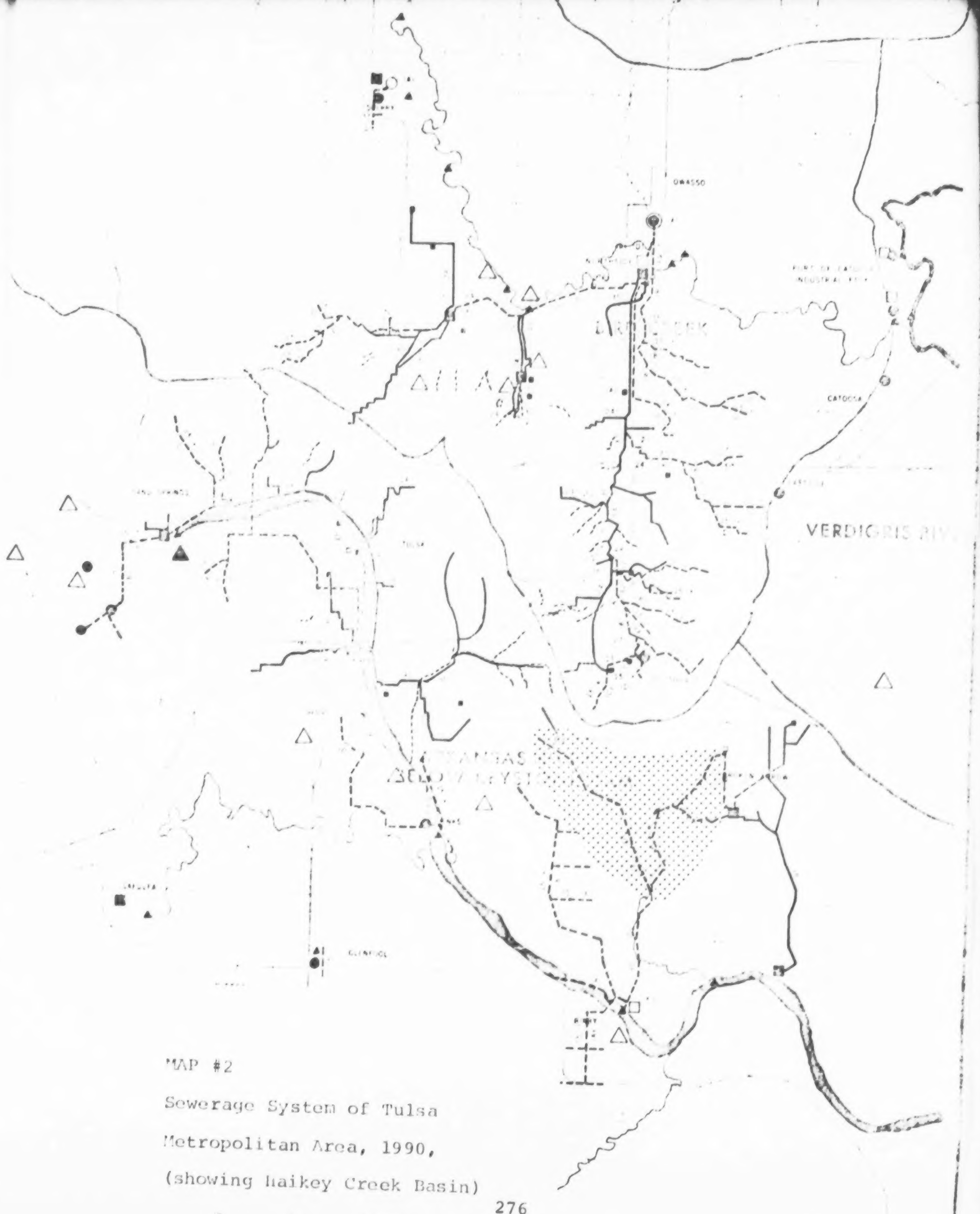
The Regional Metropolitan Utility Authority is a trust whose beneficiaries include Tulsa, Broken Arrow, and the towns of Brisby and Jenks. These last two have not contributed money to the system as yet, and will not connect to the proposed interceptor lines, but they are expected soon to apply for connection by independent lines to the treatment plant. It is hoped that the project will be similarly cooperative, as has distinguished the Tulsa/Broken Arrow relationship, and that no duplication of linework will be built. Differing rates of growth between the towns may mean that they will not want to connect at the same time. Bixby is expected to want to joint quite soon, within the next two years, but Jenks' intentions are not clear.

APPENDIX

TULSA/BROKEN ARROW INTERCEPTORS

TULSA METROPOLITAN AREA
PLANNING DISTRICTS


DISTRICT BOUNDARIES
SUBAREA BOUNDARIES
13
14
12
NORTHSIDE
15
24
11
25
16
NORTHEAST
2
3
10
1
4
5
17
7
CENTRAL
6
9
23
SOUTHWEST
8
18
SOUTHEAST
19
22
21
20
1
CENTRAL
7

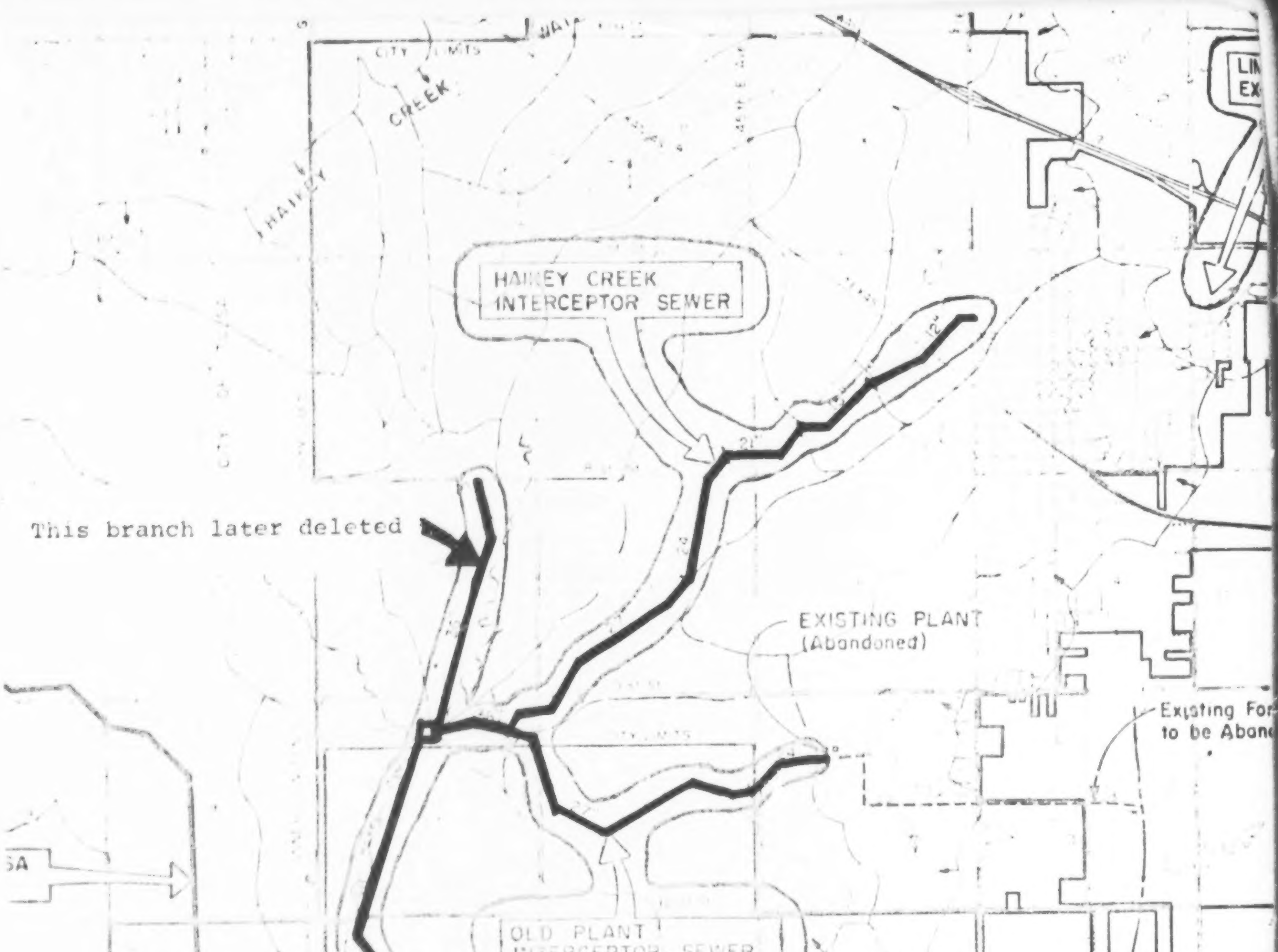

OWASSO
PORT OF CATOOSA INDUSTRIAL AREA
CATOOSA
VERDIGRIS RIV
SAND SPRINGS
TULSA
SAPULPA
GLENPOOL

MAP #2

Sewerage System of Tulsa

Metropolitan Area, 1990,

(showing Haikey Creek Basin)


CITY LIMITS
HAIKEY CREEK
HAIKEY CREEK INTERCEPTOR SEWER
EXISTING PLANT (Abandoned)
Existing For
to be Aband
OLD PLANT INTERCEPTOR SEWER
PROPOSED CITY OF BROKEN ARROW HAIKEY CREEK TRUNK MAIN
CITY OF BIXBY
LYNN LANE
SA

This branch later deleted

MAP #3

Broken Arrow Interceptor;;

Early Version, Showing Deleted

Northern Branch

TULSA/BROKEN ARROW

APPENDIX

	Sewer Interceptor	Old Plant Line	Haikey Creek Trunk	Haikey Creek Interceptor
Length	30,045'	14,700'	15,100'	17,000'
Type	gravity	grav	grav	grav
Area served	4130 acres/6.45 mi^2	--	13,500 acres	21.1 mi^2
Diameter (Inches)	36	36	54	27
Area initial flow	.2 MGD		.52 MGD	
Area design flow (year)	1.84 (1980)		1.84 MGD (1980)	
Area ultimate flow (year)	5 MGD (2000)		7.7 MGD	
Maximum ultimate flow (year)	11 MGD (2000)		27.5 MGD	
Per capita use	100 GPD		100 GPD	
Maximum per capita use	250 GPD		250 GPD	
Cost	$993,036.98		$1,875,300.00	

REGIONAL SEWAGE TREATMENT PLANT INITIAL CAPACITY - 3.68 MGD -

FINANCING

TULSA

date of figures - June 12, 1974

Total cost of project	$1,193,125	
EPA eligible cost	1,193,125	
Federal share	894,843.75	(75%)
Local Share	298,281.25	(25%)
Interceptor costs	990,036.98	(83% of Total)
% Share of engineering and other costs attributable to interceptors	200,088.02	(100%)

BROKEN ARROW

date of figures - February 12, 1974

Total cost of project	$1,875,300.00	
EPA eligible cost	1,825,300.00	
Federal share	1,368,975.00	(73%)
Local share	506,325.00	(27%)
Interceptor costs	1,531,883.59	(82% of Total)
% Share of engineering and other costs attributable to interceptor(s)	226,502.96	(93.4%)

POPULATION

	TULSA	BROKEN ARROW
Present	5,000	7,500
1980	18,400	18,400
1985		26,400
2000	41,300 Sewco interceptor only	
Ultimate Basin Population at 10/acre	- 236,000 -	

POPULATION CHANGES BY PLANNING DISTRICT
TULSA METROPOLITAN AREA, 1960-1970

			Change 1960-1970		Percent of
	1960	1970	Number	Percent	Total Change
Central					
1	9,696	3,900	-5,796	-59.8%	
4	39,593	33,314	-6,279	-15.9%	
6	46,059	47,498	1,439	3.1%	
7	3,953	4,545	592	15.0%	
Subtotal	(99,301)	(89,257)	(-10,044)	(- 10.1%)	(-18.1%)
Northeast					
14	3,859	5,059	1,200	31.1%	
15	3,124	6,085	2,961	94.8%	
16	25,706	22,948	-2,758	-10.7%	
Subtotal	(32,689)	(34,092)	(1,403)	(4.3%)	(2.5%)
Northside					
2	38,932	31,667	-7,265	-18.7%	
3	24,583	22,648	-1,935	- 7.9%	
10	18,698	15,204	-3,494	-18.7%	
11	3,414 1/	4,727	1,313	38.5%	
12	1,644	2,305	661	40.2%	
13	1,891	2,428	537	28.4%	
24	4,577	7,540	2,963	64.7%	
25	22,142	25,300	3,158	14.7%	
Subtotal	(115,881)	(111,819)	(- 4,062)	(-3.5%)	(-7.3%)
Southeast					
5	31,796	41,125	9,329	29.3%	
17	3,497	24,122	20,625	589.8%	
18	13,814	42,295	28,481	206.2%	
19	8,582	13,203	4,621	53.8%	
20	3,801	5,954	2,153	56.6%	
Subtotal	(61,490)	(126,699)	(65,209)	(106.0%)	(117.6%)
Southwest					
8	2,846	3,844	998	35.1%	
9	18,285	15,987	-2,298	-12.6%	
21	1,394	1,796	402	28.8%	
22	2,356	3,329	973	41.3%	
23	15,210	18,069	2,859	18.8%	
Subtotal	(40,091)	(43,025)	(2,934)	(7.3%)	(5.3%)
Total	349,452	404,892	55,140	15.9%	100.0%

1/ Excludes part of Osage County.

Source: Census of Population 1960, 1970 and Hammer, Siler, George Associates.

POPULATION TRENDS AND PROJECTIONS BY PLANNING DISTRICT, TULSA METROPOLITAN AREA, 1960-2000

	1960	1970	1973	1980	1990	2000
Central						
1	9,696	3,900	2,500	2,550	4,100	5,590
4	39,593	33,310	30,900	31,050	35,200	37,890
6	46,059	47,500	47,200	48,700	52,900	56,360
7	3,953	4,540	4,100	4,650	5,850	6,660
Subtotal	(99,301)	(89,250)	(84,700)	(86,950)	(98,050)	(106,500)
Northeast						
14	3,859	5,060	5,800	6,000	6,600	7,670
15	3,124	6,090	6,800	8,950	13,650	17,680
16	25,706	22,950	21,200	22,300	24,100	25,880
Subtotal	(32,689)	(34,100)	(33,800)	(37,250)	(44,350)	(51,230)
North Side						
2	38,932	31,660	25,000	19,400	25,100	26,740
3	24,583	22,645	19,250	17,070	18,720	20,910
10	18,698	15,200	14,150	12,930	12,530	13,310
11	3,414 1/	4,725	4,350	10,830	21,200	28,780
12	1,644	2,305	2,300	2,250	2,500	2,840
13	1,891	2,425	2,550	2,790	3,100	3,620
24	4,577	7,540	6,500	7,900	8,550	9,990
25	22,142	25,300	23,200	20,300	20,050	21,870
Subtotal	(115,881)	(111,800)	(97,300)	(93,450)	(111,750)	(128,060)
Southeast						
5	31,796	41,125	42,400	40,970	43,450	48,280
17	3,497	24,120	32,150	40,940	42,450	44,980
18	13,814	42,295	56,650	68,950	67,100	71,740
19	8,582	13,205	18,200	33,560	38,450	43,870
20	3,801	5,955	6,800	8,980	11,000	13,220
Subtotal	(61,490)	(126,700)	(156,200)	(193,400)	(202,500)	(222,090)
Southwest						
8	2,846	3,850	5,000	6,750	8,120	8,860
9	18,285	15,990	16,700	15,760	16,450	17,290
21	1,394	1,800	1,800	2,230	2,380	2,700
22	2,356	3,335	4,100	5,870	7,350	9,790
23	15,210 1/	18,075	19,400	20,250	22,650	26,080
Subtotal	(40,091)	(43,050)	(47,000)	(50,850)	(56,950)	(64,720)
Total, TMA	349,452	404,900	419,000	461,900	513,600	572,600

1/ Excludes part of Osage County.

Source: U.S. Census of Population, 1960, 1970; and Hammer, Siler, George Associates.

HOUSEHOLD CHANGES BY PLANNING DISTRICT
TULSA METROPOLITAN AREA, 1960-1970

			Change 1960-1970		Percent of
	1960	1970	Number	Percent	Total Change
Central					
1	5,077	2,167	-2,910	- 57.3%	
4	15,222	14,626	- 596	- 3.9%	
6	15,259	18,220	2,961	19.4%	
7	1,822	2,408	586	32.2%	
Subtotal	(37,380)	(37,421)	(41)	(.1%)	(0.2%)
Northeast					
14	1,277	1,628	351	27.5%	
15	855	1,753	898	105.0%	
16	6,879	7,342	469	68.2%	
Subtotal	(9,011)	(10,729)	(1,718)	(19.1%)	(7.1%)
Northside					
2	12,717	10,947	-1,770	-13.9%	
3	7,744	7,842	98	1.3%	
10	5,805	4,977	- 828	-14.3%	
11	1,126 1/	1,446	320	28.4%	
12	483	720	237	49.1%	
13	624	768	144	23.1%	
24	1,279	2,100	821	64.2%	
25	5,703	6,755	1,052	18.4%	
Subtotal	(35,481)	(35,555)	(74)	(0.2%)	(0.3%)
Southeast					
5	8,943	12,640	3,697	41.3%	
17	981	6,739	5,758	587.0%	
18	3,718	12,843	9,125	245.4%	
19	2,559	3,921	1,362	53.2%	
20	1,151	1,842	691	60.0%	
Subtotal	(17,352)	(37,985)	(20,633)	(118.9%)	(85.1%)
Southwest					
8	812	1,190	378	46.6%	
9	5,466	5,151	- 315	- 5.8%	
21	382	544	162	42.4%	
22	673	992	319	47.4%	
23	4,582 1/	5,797	1,215	26.5%	
Subtotal	(11,915)	(13,674)	(1,759)	(14.8%)	(7.3%)
Total	111,139	135,364	24,225	21.8%	(100.0%)

1/ Excludes part of Osage County.

Source: U.S. Census of Population 1960, 1970; and Hammer, Siler, George Associates.

HOUSEHOLD TRENDS AND PROJECTIONS BY PLANNING DISTRICT, TULSA METROPOLITAN AREA, 1960-2000

	1960	1970	1973	1980	1990	2000
Central						
1	5,077	2,165	1,550	1,700	2,750	3,850
4	15,222	14,625	14,300	14,400	14,250	15,460
6	15,259	18,220	19,190	20,300	21,600	22,860
7	1,822	2,410	2,500	2,600	3,080	3,460
Subtotal	(37,380)	(37,420)	(37,540)	(39,000)	(41,680)	(45,630)
Northeast						
14	1,277	1,630	1,730	2,000	2,340	2,720
15	855	1,755	1,885	2,750	4,660	6,720
16	6,879	7,345	7,855	8,350	8,700	9,140
Subtotal	(9,011)	(10,730)	(11,470)	(13,100)	(15,700)	(18,580)
North Side						
2	12,717	10,950	9,620	7,600	9,650	10,790
3	7,744	7,840	7,400	6,700	7,200	7,510
10	5,805	4,975	4,800	4,700	4,550	4,840
11	1,126 1/	1,445	1,400	3,800	8,150	11,320
12	483	720	740	770	880	990
13	624	770	800	930	1,100	1,300
24	1,279	2,100	1,975	2,550	2,950	3,480
25	5,703	6,755	6,625	7,000	7,400	7,960
Subtotal	(35,481)	(35,555)	(33,360)	(34,050)	(41,880)	(48,190)
Southeast						
5	8,943	12,640	14,350	16,390	18,100	19,960
17	981	6,740	9,450	12,800	15,610	17,660
18	3,718	12,845	17,700	22,980	26,490	29,110
19	2,559	3,920	5,200	10,490	13,830	16,750
20	1,151	1,840	2,050	2,850	3,820	4,830
Subtotal	(17,352)	(37,985)	(48,750)	(65,510)	(77,850)	(88,310)
Southwest						
8	812	1,190	1,600	2,300	2,900	3,460
9	5,466	5,150	5,530	5,950	6,200	6,380
21	382	545	550	730	820	970
22	673	990	1,170	1,810	2,520	3,670
23	4,582 1/	5,800	6,030	6,750	7,950	9,510
Subtotal	(11,915)	(13,675)	(14,880)	(17,540)	(20,390)	(23,990)
Total, TMA	111,139	135,365	146,000	169,200	197,500	224,700

1/ Excludes part of Osage County.

Source: 1970 U.S. Census of Population and Hammer, Siler, George Associates.

TMA HOUSING PRODUCTION REQUIREMENTS BY PLANNING DISTRICT, 1973-2000

	Single-Family		Multi-Family	
	Replacement Requirement	Total Production	Replacement Requirement	Total Production
Central				
1	200	600	1,100	3,000
4	1,700	1,300	1,300	2,200
6	1,300	1,950	800	3,100
7	400	650	400	950
Subtotal	3,600	4,500	3,600	9,250
Northeast				
14	300	1,000	25	300
15	200	3,700	75	1,550
16	400	800	200	1,050
Subtotal	900	5,500	300	2,900
North Side				
2	4,500	2,450	1,300	3,150
3	1,600	900	400	800
10	1,500	750	200	600
11	400	7,000	-	3,500
12	100	250	-	100
13	100	450	50	200
24	300	950	-	300
25	500	600	-	600
Subtotal	9,000	13,350	1,950	9,250
Southeast				
5	500	1,150	200	4,900
17	500	4,400	300	4,650
18	400	6,250	700	5,100
19	600	8,700	100	3,800
20	500	2,500	-	850
Subtotal	2,500	23,000	1,300	19,300
Southwest				
8	200	1,250	-	700
9	1,100	1,200	-	600
21	100	400	-	150
22	200	1,950	-	800
23	1,100	3,100	300	1,650
Subtotal	2,700	7,900	300	3,900
Total TMA	18,700	54,250	7,450	44,600

Source: Hammer, Siler, George Associates.

SINGLE-FAMILY HOUSING UNITS BY PLANNING DISTRICT, TMA, 1973-2000

	1973	1980	1990	2000
Central				
1	300	350	750	700
4	10,700	10,450	10,000	10,300
6	14,600	14,850	15,000	15,450
7	900	900	1,000	1,150
	26,700	26,550	26,750	27,600
Northeast				
14	1,750	1,950	2,200	2,450
15	1,750	2,400	3,830	5,250
16	7,900	8,000	8,100	8,300
	11,400	12,350	14,130	16,000
North Side				
2	9,430	6,580	7,080	7,380
3	7,300	6,700	6,700	6,600
10	4,900	4,750	4,250	4,150
11	1,600	3,000	5,900	8,200
12	770	800	860	920
13	800	880	1,000	1,150
24	2,600	2,670	2,870	3,250
25	6,700	6,500	6,550	6,800
	34,100	31,880	35,210	38,450
Southeast				
5	12,250	12,900	12,900	12,900
17	8,950	11,350	12,350	12,850
18	13,600	16,400	17,800	19,400
19	4,850	9,250	11,350	12,950
20	2,100	2,700	3,400	4,100
	41,750	52,600	57,800	62,200
Southwest				
8	1,500	1,800	2,200	2,550
9	5,200	5,250	5,250	5,300
21	550	650	750	850
22	1,200	1,700	2,230	2,950
23	6,100	6,500	7,200	8,100
	14,550	15,900	17,630	19,750
Total TMA	128,500	139,280	151,520	164,000

Source: Hammer, Siler, George Associates

MULTIPLE-FAMILY HOUSING UNITS BY PLANNING DISTRICT, TMA, 1973-2000

	1973	1980	1990	2000
Central				
1	1,550	1,650	2,150	3,450
4	4,970	4,970	4,970	5,870
6	6,150	6,700	7,450	8,450
7	2,000	2,100	2,300	2,550
	14,670	15,420	16,870	20,320
Northeast				
14	75	125	200	350
15	250	500	975	1,725
16	250	550	850	1,100
	575	1,175	2,025	3,175
North Side				
2	2,065	1,915	3,015	3,915
3.	750	750	850	1,150
10	450	400	500	850
11	100	1,100	2,600	3,600
12	0	0	50	100
13	50	100	150	200
24	25	25	175	325
25	825	925	1,075	1,425
	4,265	5,215	8,415	11,565
Southeast				
5	3,315	4,315	6,015	8,015
17	1,200	2,050	3,850	5,550
18	6,700	8,100	9,900	11,150
19	750	1,750	3,000	4,450
20	50	250	550	900
	12,015	16,465	23,315	30,065
Southwest				
8	350	650	850	1,050
9	700	1,000	1,150	1,300
21	0	100	100	150
22	50	200	400	850
23	375	625	1,025	1,725
	1,475	2,575	3,525	5,075
Total TMA	33,000	40,850	54,150	70,200

Source: Hammer, Siler, George Associates

TMA TOTAL HOUSING UNITS BY PLANNING DISTRICT, 1960-1973

	1960	1970	1973	1980	1990	2000
Central						
1	6,604	2,577	1,850	2,000	2,900	4,150
4	16,312	15,662	15,670	15,420	14,970	16,170
6	16,110	19,658	20,950	21,550	22,450	23,900
7	2,138	2,891	2,900	3,000	3,300	3,700
Subtotal	(41,194)	(40,788)	(41,370)	(41,970)	(43,620)	(47,920)
Northeast						
14	1,388	1,723	1,825	2,075	2,400	2,800
15	916	1,828	2,000	2,900	4,805	6,975
16	7,210	7,628	8,150	8,550	8,950	9,400
Subtotal	(9,514)	(11,179)	(11,975)	(13,525)	(16,155)	(19,175)
North Side						
2	13,946	12,442	11,495	8,495	10,095	11,295
3	8,145	8,238	8,050	7,450	7,550	7,750
10	6,290	5,288	5,350	5,150	4,750	5,000
11	1,355	1,663	1,700	4,100	8,500	11,800
12	525	748	770	800	910	1,020
13	692	822	850	980	1,150	1,350
24	1,402	2,237	2,625	2,695	3,045	3,575
25	6,107	7,324	7,525	7,425	7,625	8,225
Subtotal	(38,462)	(38,762)	(38,365)	(37,095)	(43,625)	(50,015)
Southeast						
5	9,351	13,327	15,565	17,215	18,915	20,915
17	1,213	7,122	10,150	13,400	16,200	18,400
18	4,008	13,978	20,300	24,500	27,700	30,550
19	2,768	4,193	5,600	11,000	14,350	17,400
20	1,263	1,906	2,150	2,950	3,950	5,000
Subtotal	(18,603)	(40,526)	(53,765)	(69,065)	(81,115)	(92,265)
Southwest						
8	901	1,234	1,350	2,450	3,050	3,600
9	5,879	5,542	5,900	6,250	6,400	6,600
21	424	562	550	750	850	1,000
22	747	1,035	1,250	1,900	2,650	3,800
23	4,985	6,109	6,475	7,125	8,225	9,825
Subtotal	(12,936)	(14,482)	(16,025)	(18,475)	(21,175)	(24,825)
Total TMA	120,709	145,737	161,500	180,130	205,690	234,200

Source: U.S. Census of Population 1960 and 1970, INCOG, Tulsa, Oklahoma, and Hammer, Siler, George Associates.

EMPLOYMENT GROWTH ALLOCATION FORMULA, TMA, 1973-2000

Employment Category	Percent of Employment Growth in Land Use Category Industrial	 Office	 Other
Agriculture	--	--	100%
Mining	50%	50%	--
Construction	100%	--	--
Manufacturing	100%	--	--
T.C.U.	50%	50%	--
Retail	--	15%	85%
Wholesaling - warehousing	100%	--	--
FIRE	--	100%	--
Services	--	65%	35%
Government	--	30%	70%
Other	--	--	100%

Source: Hammer, Siler, George Associates.

ESTIMATED EMPLOYMENT DISTRIBUTION
TMA, 1972, 1980

	Estimated 1972 Distribution			Estimated 1980 Distribution		
	Industrial	Office	Other	Industrial	Office	Other
Central						
1	3,500	22,000	9,500	3,700	27,500	13,500
4	2,400	1,000	2,200	2,700	1,300	2,400
6	1,800	2,100	8,900	2,050	2,900	9,000
7	400	1,300	1,100	400	1,500	1,200
Subtotal	8,100	26,400	21,700	8,850	33,200	26,100
Northeast						
14	175	50	700	345	50	800
15	700	50	475	1,680	400	775
16	18,925	1,350	3,700	23,825	1,850	4,000
Subtotal	19,800	1,450	4,875	25,850	2,300	5,575
North Side						
2	2,800	375	3,200	4,200	575	3,400
3	3,850	400	2,600	3,950	650	2,750
10	2,900	225	3,700	3,040	425	3,750
11	200	175	500	300	675	900
12	300	75	200	350	75	200
13	200	100	50	200	100	50
24	175	75	700	275	75	800
25	275	100	3,100	415	100	3,200
Subtotal	10,700	1,525	14,050	12,730	2,675	15,050
Southeast						
5	4,200	2,500	10,900	4,600	3,300	11,500
17	1,700	1,700	6,350	2,750	2,250	7,550
18	9,600	3,350	8,800	10,900	4,150	11,100
19	1,150	425	1,900	2,150	1,275	2,950
20	350	50	775	450	100	1,075
Subtotal	17,000	8,025	28,725	20,850	11,075	34,175
Southwest						
8	1,450	300	750	2,150	300	1,100
9	13,800	600	2,900	14,350	650	3,350
21	150	50	250	150	50	300
22	900	50	150	1,070	75	250
23	5,550	650	3,300	5,900	675	3,800
Subtotal	21,850	1,650	7,350	23,620	1,750	8,800
TOTAL TMA	77,450	39,050	76,700	91,900	51,000	89,700

Source: Hammer, Siler, George Associates.

ESTIMATED EMPLOYMENT DISTRIBUTION
TMA, 1990, 2000

	Estimated 1990 Distribution			Estimated 2000 Distribution		
	Industrial	Office	Other	Industrial	Office	Other
Central						
1	3,800	33,800	17,500	3,900	40,800	21,000
4	2,900	1,700	2,500	3,200	1,975	2,700
6	2,250	3,700	10,500	2,600	4,500	11,400
7	400	1,900	1,200	400	2,500	1,300
Subtotal	9,350	41,100	31,700	10,100	49,775	36,400
Northeast						
14	400	50	800	475	50	900
15	3,700	600	925	5,350	875	1,275
16	26,500	2,050	4,400	28,425	2,300	4,800
Subtotal	30,600	2,700	6,125	34,250	3,225	6,975
North Side						
2	5,500	800	3,650	6,900	1,125	3,975
3	4,000	850	2,900	4,050	1,100	3,100
10	3,100	625	3,900	3,200	1,000	4,100
11	1,900	1,175	1,300	2,500	1,375	1,600
12	400	75	200	425	75	200
13	250	100	50	325	100	50
24	400	75	900	600	75	1,100
25	700	100	3,500	1,225	100	3,800
Subtotal	16,250	3,800	16,400	19,225	4,950	17,925
Southeast						
5	4,700	3,700	11,600	4,975	4,150	11,800
17	3,100	2,950	7,950	4,075	3,675	8,250
18	12,800	4,800	11,200	13,875	5,350	11,300
19	3,150	1,925	4,300	4,025	2,325	5,700
20	450	150	1,550	475	150	1,750
Subtotal	24,200	13,525	36,600	27,425	15,650	38,800
Southwest						
8	3,300	400	1,500	4,050	500	1,650
9	14,750	650	3,800	15,525	675	4,100
21	200	50	300	250	50	350
22	1,300	100	300	1,550	125	350
23	6,500	700	3,400	7,175	750	4,100
Subtotal	26,050	1,900	9,300	28,550	2,100	10,550
TOTAL TMA	106,450	63,025	100,125	119,550	75,700	110,650

Source: Hammer, Siler, George Associates.